

# TOSHIBA

Low Voltage Three-Phase Squirrel-cage Induction Motor

## Premium Gold Motor

**PGM** Premium  
Gold Motor



# Premium Efficiency for the Green Earth

High efficiency technology of TOSHIBA Motor for over 120-year-old brings more value to industrial products and terrestrial environment.



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~taking over 120 years tradition and leading to brilliant, golden future~  
**Premium Gold Motor (PGM) now available**

### High efficiency technology inherited from the past created Premium Gold Motor (PGM)

In 1978, 83 years after Toshiba introduced the first domestic induction motor in 1895, we introduced a pioneering high efficiency motor, "Gold Motor." Since then, we have continued to comply many high efficiency motor regulations. Now, we have introduced a new era, premium efficiency motor, "Premium Gold Motor (PGM)" complied with the Top runner scheme.

- 1982 : JEM (Japan Electrical Manufacturers) -TR137 "Totally Enclosed Energy Saving Motors" was enacted.
- 1997 : Energy Policy Act took effect in the US.
- Jul. 2000 : JIS C 4212 "High Efficiency Low Voltage Three Phase Induction Motor" was enacted.
- Dec. 2010 : Energy Independence and Security Act (EISA) took effect.
- Jun. 2011 : EU Regulations (No. 640/2009) took effect.
- Sept. 2012 : China Energy Efficiency Goal Code of Practice (GB3 class) was revised.
- Oct. 2013 : A part of "Energy Saving Act" was revised in Japan.
- Non. 2013 : "Manufacturers' Criteria Regarding Improvement of AC Motors" was enacted by the notice of Ministry of Economy, Trade and Industry.
- Apr. 2015 : Top Runner scheme starts.

### Meet the Top runner scheme and comply with IE3 of Japan's three ratings

PGM satisfies targeted standards of Energy Saving Act to start in 2015. PGM also achieved efficiency level IE3 (premium efficiency) set by JIS C 4034-30:2011 for 200V-50Hz, 200/220V-60Hz (as well as 400V class) in Japan.

### 230V-60Hz as standard to satisfy US high efficiency regulation

4 ratings (200V-50Hz, 200/220/230V-60Hz) are available as standard; 3 ratings for Japan (200V-50Hz, 200/220V-60Hz), 230V-60Hz for US. 230V-60Hz for US complies with Energy Independence and Security Act (EISA) and is certified by Conformity Certification No. (CC No.).

\*Not satisfy UL standard.

### High Reliability regarding the Characteristics and Performance

Our IE3 motor manufacture plants in Vietnam obtained accreditation by NVLAP and are certified as motor efficiency test shop by NIST, a US institution leading high efficiency motors. Conformity Certification No. (CC No.) by DOE is given only to the test results conducted in certified test shop.

\*NIST : National Institute of Standards and Technology  
 \*NVLAP : National Voluntary Laboratory Accreditation Program  
 \*DOE : the United States Department of Energy

### Compatible with Toshiba standard efficiency motors in the same frame size

PGM has the same frame size as our standard efficiency motors. It is easy to replace existing standard motor with PGM. The total length of PGM is almost the same as that of the standard efficiency motors.

### Apply Insulation Class 155 (F) (Temperature Rise B) for All Models, Improve Reliability

Insulation class 155 (F) is applied to all models to hold temperature rise under B rise, which further improves reliability of insulation.



# Premium Gold Motor could make great contribution to protect the Green Earth.

Reduces loss by 30~40% compared to our standard efficiency motors,  
and increase energy saving effect

PGM can recover the price gap of initial purchase cost between PGM and standard efficiency motor for a short period of time because of 30~40% loss reduction. PGM improved energy saving effects because of much lower running cost than that of the existing high efficiency motor (Gold Motor).

\*This is a result of a trial comparison between our standard efficiency motors and our premium gold motor at rated output power. Loss reduction rate and payback period will depend on the usage condition.

**Calculating electricity cost** The following calculation formula indicates annual electricity cost saved by use of PGM. (Unit: Japanese Yen per year)

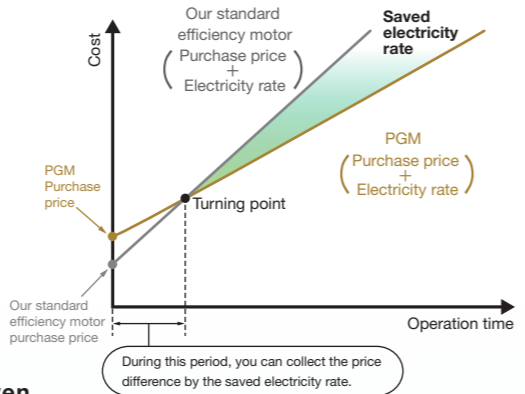
$$S = W \times C \times N$$

- W** = Input power difference between standard efficiency motor and PGM (kW)  
(Please see Performance Data for your reference)
- C** = Electric utility rate (Yen/kWh)  
\*Electric utility rate includes basic rate, taxes, etc., depending on contracted amount of electricity.
- N** = annual operation time (h/year)

<Example>  
4poles-3.7kW-200V-50Hz, Operation hours 5,000h/year, Electricity rate 16yen/kWh  
W=0.363kW (from the table below), C=16yen/kWh, N=5,000h/year

**Saved Electricity Rate S=W×C×N=0.363×16×5,000=29,040yen**

\*This is just a calculation and not guaranteed. Saved electricity rate will differ by the calculation terms.



**Calculating payback period** The following calculation formula indicates payback period of the price gap initially purchased between PGM and standard efficiency motor.

$$\text{Payback Period (year)} = \frac{\left[ \text{purchase cost of PGM (yen)} \right] - \left[ \text{purchase cost of our standard efficiency motor (yen)} \right]}{\text{saved electric utility rate (yen / year)}}$$

Output (kW)	Voltage [V]	Frequency [Hz]	Input power difference between standard efficiency motor and PGM [kW] (at 100% load)		
			2-Pole	4-Pole	6-Pole
0.75	200	50	0.040	0.047	0.116
	200	60	0.060	0.047	0.112
	220	60	0.066	0.048	0.090
1.5	200	50	0.111	0.136	0.307
	200	60	0.082	0.106	0.273
	220	60	0.089	0.095	0.229
2.2	200	50	0.143	0.236	0.478
	200	60	0.129	0.201	0.460
	220	60	0.156	0.156	0.362
3.7	200	50	0.265	0.363	0.455
	200	60	0.309	0.355	0.497
	220	60	0.336	0.295	0.411
5.5	200	50	0.292	0.421	0.636
	200	60	0.341	0.383	0.675
	220	60	0.407	0.322	0.577

Output (kW)	Voltage [V]	Frequency [Hz]	Input power difference between standard efficiency motor and PGM [kW] (at 100% load)		
			2-Pole	4-Pole	6-Pole
7.5	200	50	0.391	0.528	0.376
	200	60	0.442	0.432	0.407
	220	60	0.345	0.396	0.393
11	200	50	0.460	0.744	0.632
	200	60	0.384	0.797	0.678
	220	60	0.514	0.647	0.639
15	200	50	0.491	1.090	0.271
	200	60	0.512	1.210	0.257
	220	60	0.542	0.889	0.303
18.5	200	50	0.464	0.794	0.608
	200	60	0.404	0.791	0.636
	220	60	0.465	0.695	0.631
22	200	50	1.110	0.810	0.590
	200	60	1.150	0.832	0.563
	220	60	1.330	0.714	0.675

Output (kW)	Voltage [V]	Frequency [Hz]	Input power difference between standard efficiency motor and PGM [kW] (at 100% load)		
			2-Pole	4-Pole	6-Pole
30	200	50	1.24	1.16	1.32
	200	60	1.21	1.16	1.27
	220	60	1.16	1.11	1.21
37	200	50	1.34	1.16	1.21
	200	60	2.09	1.37	1.49
	220	60	2.03	1.23	1.22
45	200	50	2.69	1.87	1.51
	200	60	3.46	1.97	1.62
	220	60	3.25	1.80	1.49
55	200	50	2.69	2.58	—
	200	60	3.54	3.26	—
	220	60	3.17	2.70	—

More energy saving  
with variable speed drive

In addition to energy saving effect at a low speed with VARIABLE SPEED DRIVE, PGM itself further improves energy saving effect.

Allowable torque is improved compared to our standard efficiency motors by loss reduction.

\*Allowable torque for 4-Pole or 6-Pole motors: 100% of constant torque operation in 1:10 (6~60Hz); in case of Vector control, 100% of constant torque operation in 1:20 (3~60Hz).

Top mounted terminal box available

To meet the various needs of consumers, top mounted terminal box for motors of frame size 90L or above is available. Upper mounted terminal box shortens overall width of the motors.



Low Noise Levels

Low noise levels with appropriate cooling performance are achieved pursuing appropriate shapes of fans and fan covers by using fluid dynamics.

Even 2-Pole – 60Hz motors satisfy low noise level of less than 80 dB (A).

Support additional options & comply with overseas efficiency regulations.

Additional options—position of terminal box, rotational direction, shaft end screw, mounting direction (shaft up, shaft down, horizontal shaft), corrosion proof, frame earth terminal, etc.—are available. PGM also satisfy overseas regulations. (Please refer to page 27 for details)

IP55 degree of protection for outdoor use.  
Improved environmental durability.

PGM for outdoor use have IP55 degree of protection as standard to improve environmental durability. IP55 has better degree of protection from solid objects and water than existing IP44.







**Indoor Use/Totally Enclosed Fan Cooled/ Foot Mounted (top mounted terminal box) 0.75kW~55kW**

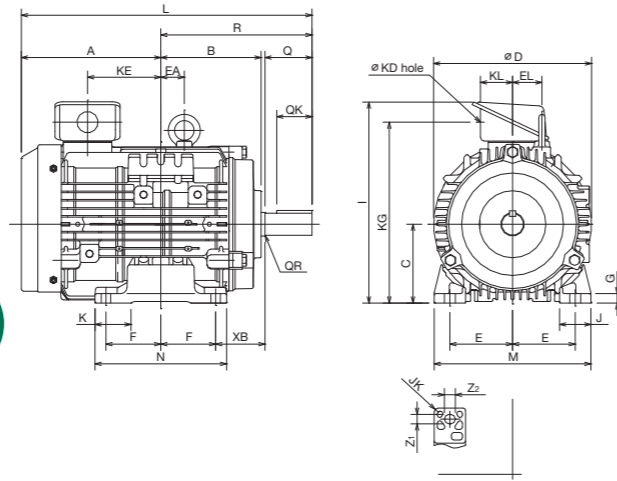


Figure 1

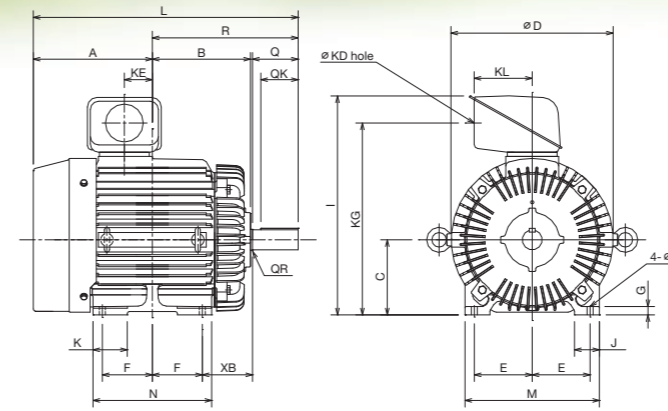


Figure 2

Shared Shaft End

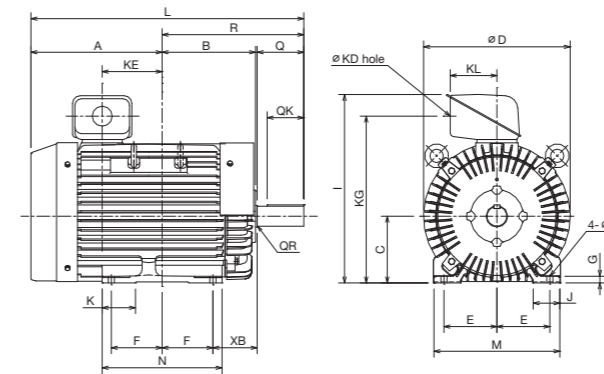
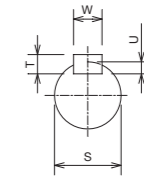


Figure 3

TYPE & FORM	Frame size	Output (kW)			Figure No.	Dimensions (mm)																				Terminal box								Shaft end								Bearing No.				Approx. weight (kg)			Frame size
		2-Pole	4-Pole	6-Pole		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	Z1	Z2	EA	EL	2-Pole		Over 4poles		2-Pole	4-Pole	6-Pole							
																																				KD	KE	KG	KL				Q	QK	QR	S	W	T	
Up to 3.7kW IKKH3- FCKA21E/ FBKA21E	90L	1.5	1.5	0.75	1	154.5	113.5	90	202	70	62.5	10	246	40	40	323	176	149	168.5	10×12	56	5	—	—	27	70	219.5	41	50	40	0.5	24	8	7	4	6205C3	6205C3	6205C3	6205C3	18	21	18	90L						
	100L	—	2.2	—		178	128	100	202	80	70	12	256	40	46	371	200	168	193	12×14	63	5	—	37.5	27	93.5	229.5	41	60	45	0.5	28	8	7	4	—	—	6206C3	6205C3	—	29	—	100L						
Up to 11kW IKKH3- FCKA21E/ FBKA21E	112M	3.7	3.7	—	1	186	134	112	243	95	70	12	287	40	44	386	220	168	200	12×14	70	5	—	47	27	95	260.5	41	60	45	1.5	28	8	7	4	6207C3	6206C3	6207C3	6206C3	33	39	—	112M						
	132S	5.5	5.5	3.7		219	152	132	285	108	70	15	344	50	50	419	260	175	239	12×14	89	5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	132S							
15kW and over TKKH3- FCKA21E/ FBKA21E	132M	—	7.5	5.5	1	210.5	171	132	285	108	89	15	344	50	50	449.5	260	213	258	12×14	89	5	43.5	56.5	35	85	313.5	65	80	63	0.5	38	10	8	5	6308C3	6208C3	6308C3	6208C3	55	60	59	132S						
	160M	11	11	7.5		229.5	206	160	324	127	105	18	344	60	60	487.5	260	250	258	12×14	89	5	26.5	56.5	35	104	313.5	65	80	63	0.5	38	10	8	5	—	—	—	—	—	71	74	132M						
TKKH3- FCKA21E/ FBKA21E	160L	18.5	15	11	1	290	228	160	324	127	127	18	439.5	60	60	613	308	250	323	14.5×18.5	108	5	—2	—	52	126	386.5	90	110	90	2	42	12	8	5	6310C3	6208C3	6310C3	6208C3	92	102	96	160M						
	180M	—	18.5	15		268	228	160	324	127	127	18	439.5	60	60	613	308	294	345	14.5×18.5	108	—	20	—	52	104	386.5	90	110	90	2	42	12	8	5	—	—	—	—	116	119	116	160L						
TKKH3- FCKA21E/ FBKA21E	180M	22	18.5	15	2	287	236.5	180	391	139.5	120.5	20	525	60	82.5	638.5	324	286	351.5	14.5	121	—	—	—	91	67.5	460	140	110	90	0.5	48	14	9	5.5	6212C3	6310C3	6310C3	6310C3	195	185	190	175	180M					
	180L	30	30	18.5		346	255.5	180	391	139.5	139.5	20	525	60	82.5	716.5	324	324	370.5	14.5	121	—	—	—	91	126.5	460	140	110	90	1.5	55	16	10	6	6212C3	6310C3	6312C3	6310C3	235	235	215	230	180L					
TKKH3- FCKA21E/ FBKA21E	200L	37	—	—	3	394	280.5	200	441	159	152.5	20	565	80	100	789.5	378	360	395.5	18.5	133	—	—	—	91	180	500	140	110	90	1.5	55	16	10	6	6312C3	6312C3	—	—	330	—	—	200L						
	225S	45	37	30		394	280.5	200	441	159	152.5	20	565	80	100	819.5	378	360	425.5	18.5	133	—	—	—	91	180	500	140	140	110	1.5	60	18	11	7	—	—	6313C3	6312C3	—	—	340	335	345	370	350	225S		
TKKH3- FCKA21E/ FBKA21E	225S	55	—	—	3	381	287	225	484	178	143	22	665	80	120	783	413	366	402	18.5	149	—	—	—	91	158	568	125	110	90	1.5	55	16	10	6	6312C3	6312C3	—	—	405	—	—	—	225S					
	225S	—	55	45		381	287	225	484	178	143	22	665	80	120	813	413	366	432	18.5	149	—	—	—	91	158	568	125	140	110	1.5	65	18	11	7	—	—	6315C3	6312C3	—	—	435	420	—	225S				

(1) Tolerance of "C" dimensions is 0 - 0.5.  
(2) Tolerance of "S" is defined by JIS B 0401(dimensional tolerance); φ19-28mm: j6, φ38-48mm: k6, φ55mm or longer: m6.  
(3) Shaft end key and keyway follow parallel key and keyway of JIS B 1301. Dimensional tolerance of the keyway is standard type (N9).  
(4) The followings are standard drive systems; 2-Pole: direct-coupled, 4-Pole: belt-driven. Please contact us for more information about belt application.  
(5) Sealed ball bearing is equipped as standard.  
(6) Frame size 90L or less motors are not equipped with eye bolts.  
(7) The following models are not equipped with baffle plate; 2-Pole: 22, 30kW, 4-Pole: 18.5, 22, 30, 37, 45kW, 6-Pole: 15, 18.5, 22, 30, 45kW.

**Indoor Use/Totally Enclosed Fan Cooled/ Foot Mounted (terminal box on the opposite side) 0.75kW~55kW**

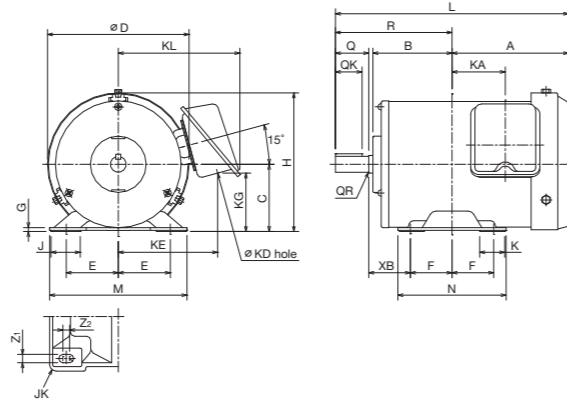


Figure 1

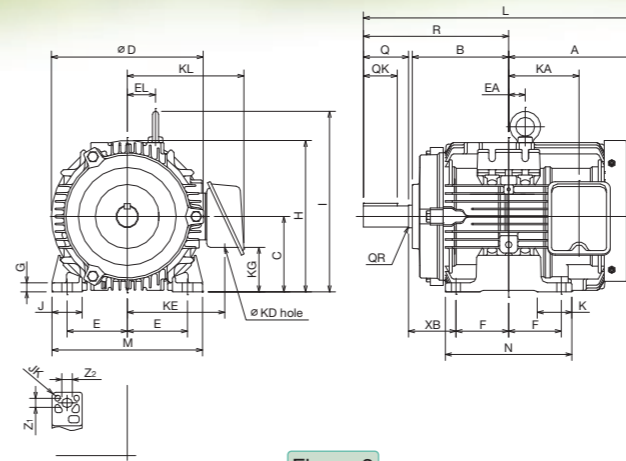


Figure 2

Shared Shaft End

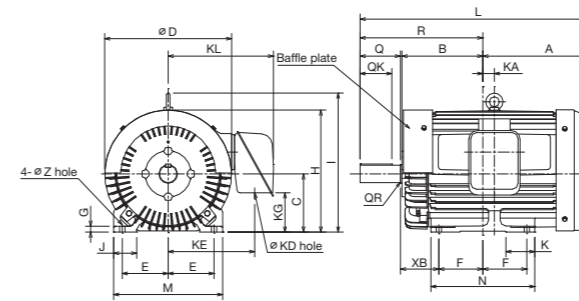
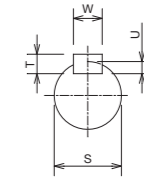


Figure 3

TYPE & FORM	Frame size	Output (kW)			Figure No.	Dimensions (mm)																				Bearing No.								Approx. weight (kg)			Frame size													
		2-Pole	4-Pole	6-Pole		A	B	C	D	E	F	G	H	I	J	K	L	M	N	R	Z (Z <sub>1</sub> ×Z <sub>2</sub> )	XB	JK	EA	EL	Terminal box				Shaft end				2-Pole		Over 4poles		2-Pole	4-Pole	6-Pole										
																										KA	KD	KE	KG	KL	Q	QK	QR	S	W	T					U	Drive end	Non drive end	Drive end	Non drive end					
IKH3-FCKK21E/ FBK21E	80M	0.75	—	—	1	122	95	80	170	62.5	50	4.5	165	—	35	30	262	165	130	140	10×8	50	8	—	—	46	22	121	69	146	40	32	0.5	19	6	6	3.5	6204C3	6204C3	—	—	11.5	—	—	80M					
		—	0.75	—		140											280									—												—	64	—	—	—	—	—		—	—	—	—	—
Up to 3.7kW IKH3-FCKA21E/ FBKA21E	90L	1.5	1.5	0.75	2	154.5	113.5	90	202	70	62.5	10	191	—	40	40	323	176	149	168.5	10×12	56	5	—	—	70	27	129.5	49	156	50	40	0.5	24	8	7	4	6205C3	6205C3	6205C3	6205C3	18	21	18	90L					
	2.2	—	—	178		128	100	202	80	70	12	201	239.5	40	46	371	200	168	193	12×14	63	5	22	37.5	93.5	27	129.5	59	156	60	45	0.5	28	8	7	4	—	—	6206C3	6205C3	—	—	29	—	—	100L				
Up to 11kW IKKH3-FCKA21E/ FBKA21E	100L	—	2.2	—	2	207	128	100	202	80	70	12	201	239.5	40	46	400	200	168	193	12×14	63	5	22	37.5	93.5	27	129.5	59	156	60	45	0.5	28	8	7	4	—	—	6206C3	6205C3	—	—	—	—	32	—	100L		
	1.5	—	—	207		128	100	202	80	70	12	201	239.5	40	46	400	200	168	193	12×14	63	5	22	37.5	93.5	27	129.5	59	156	60	45	0.5	28	8	7	4	—	—	6206C3	6205C3	—	—	—	—	—	—	32	—	100L	
Up to 11kW IKKH3-FCKA21E/ FBKA21E	112M	3.7	3.7	—	2	186	134	112	243	95	70	12	233.5	263.5	40	44	386	220	168	200	12×14	70	5	23	47	95	27	148.5	71	175	60	45	1.5	28	8	7	4	6207C3	6206C3	6207C3	6206C3	33	39	—	112M					
	2.2	—	—	219		134	112	243	95	70	12	233.5	263.5	40	44	386	220	168	200	12×14	70	5	23	47	95	27	148.5	71	175	60	45	1.5	28	8	7	4	6207C3	6206C3	6207C3	6206C3	—	—	45	—	112M					
15kW and over TKKH3-FCKA21E/ FBKA21E	132S	5.5	5.5	3.7	2	210.5	152	132	285	108	70	15	274.5	313	50	50	449.5	260	175	239	12×14	89	5	24	61	85	35	181.5	67	212	80	63	0.5	38	10	8	5	6308C3	6208C3	6308C3	6208C3	55	60	59	132S					
	3.7	—	—	219		152	132	285	108	70	15	274.5	313	50	50	449.5	260	175	239	12×14	89	5	24	61	85	35	181.5	67	212	80	63	0.5	38	10	8	5	6308C3	6208C3	6308C3	6208C3	—	—	—	—	71	74	132M			
15kW and over TKKH3-FCKA21E/ FBKA21E	132M	—	7.5	5.5	2	229.5	171	132	285	108	89	15	274.5	313	50	50	487.5	260	213	258	12×14	89	5	24	61	104	35	181.5	67	212	80	63	0.5	38	10	8	5	—	—	—	—	—	—	—	—	71	74	132M		
	5.5	—	—	219		171	132	285	108	89	15	274.5	313	50	50	487.5	260	213	258	12×14	89	5	24	61	104	35	181.5	67	212	80	63	0.5	38	10	8	5	—	—	—	—	—	—	—	—	—	—	71	74	132M	
TKKH3-FCK21E/ FBK21E	160M	11	11	7.5	2	290	206	160	324	127	105	18	322	365.5	60	60	613	308	250	323	14.5×18.5	108	5	22	54	126	52	226.5	70	279.5	110	90	2	42	12	8	5	6310C3	6208C3	6310C3	6208C3	92	102	96	160M					
	7.5	—	—	219		206	160	324	127	105	18	322	365.5	60	60	613	308	250	323	14.5×18.5	108	5	22	54	126	52	226.5	70	279.5	110	90	2	42	12	8	5	6310C3	6208C3	6310C3	6208C3	—	—	—	—	103	102	96	160M		
TKKH3-FCK21E/ FBK21E	160L	18.5	15	11	2	268	228	160	324	127	127	18	322	365.5	60	60	613	308	294	345	14.5×18.5	108	5	—	54	104	52	226.5	70	279.5	110	90	2	42	12	8	5	—	—	—	—	116	119	116	160L					
	11	—	—	219		228	160	324	127	127	18	322	365.5	60	60	613	308	294	345	14.5×18.5	108	5	—	54	104	52	226.5	70	279.5	110	90	2	42	12	8	5	—	—	—	—	—	—	—	—	—	—	116	119	116	160L
TKKH3-FCK21E/ FBK21E	180M	22	18.5	15	3	287	236.5	180	391	139.5	120.5	20	375.5	434	60	82.5	638.5	324	286	351.5	14.5	121	—	—	—	—	91	280	105	345	110	90	0.5	48	14	9	5.5	6212C3	6310C3	6310C3	6310C3	190	180	170	180M					
	15	—	—	219		236.5	180	391	139.5	120.5	20	375.5	434	60	82.5	638.5	324	286	351.5	14.5	121	—	—	—	—	—	—	91	280	105	345	110	90	1.5	55	16	10	6	6212C3	6310C3	6312C3	6310C3	—	—	—	—	230	230	210	180L
TKKH3-FCK21E/ FBK21E	180L	30	30	18.5	3	346	255.5	180	391	139.5	139.5	20	375.5	434	60	82.5	716.5	324	324	370.5	14.5	121	—	—	—	—	20	91	280	105	345	110	90	1.5	55	16	10	6	6212C3	6310C3	6312C3	6310C3	—	—	—	—	230	230	210	180L
	18.5	—	—	219		255.5	180	391	139.5	139.5	20	375.5	434	60	82.5	716.5	324	324	370.5	14.5	121	—	—	—	—	—	—	20	91	280	105	345	110	90	1.5	55	16	10	6	6212C3	6310C3	6312C3	6310C3	—	—	—	—	230	230	210
TKKH3-FCK21E/ FBK21E	200L	37	—	—	3	394	280.5	200	441	159	152.5	20	420	478	80	100	789.5	378	360	395.5	18.5	133	—	—	—	—	40	91	300	135	365	110	90	1.5	55	16	10	6	6312C3	6312C3	—	—	320	—	—	200L				
	—	—	—	219		280.5	200	441	159	152.5	20	420	478	80	100	789.5	378	360	395.5	18.5	133	—	—	—	—	—	—	40	91	300	135	365	110	90	1.5	55	16	10	6	6312C3	6312C3	—	—	—	—	—	—	200L		
TKKH3-FCK21E/ FBK21E	225S	55	—	—	3	783	287	225	484	178	143	22	467	535	80	120	813	413	366	425.5	18.5	149	—	—	—	—	19	91	343	180	440	110	90	1.5	55	16	10	6	6312C3	6312C3	—	—	395	—	—	225S				
	—	—	—	219		287	225	484	178	143	22	467	535	80	120	813	413	366	425.5	18.5	149	—	—	—	—	—	—	19	91	343	180	440	110	90	1.5	55	16	10	6	6312C3	6312C3	—	—	—	—	—	—	225S		

(1) Tolerance of "C" dimensions is 0 ~ -0.5.  
(2) Tolerance of "S" is defined by JIS B 0401(dimensional tolerance); ø19-28mm: j6, ø38-48mm: k6, ø55mm or longer: m6.  
(3) Shaft end key and keyway follow parallel key and keyway of JIS B 1301. Dimensional tolerance of the keyway is standard type (N9).  
(4) The followings are standard drive systems; 2-Pole: direct-coupled, 4-Pole: belt-driven. Please contact us for more information about belt application.  
(5) Sealed ball bearing is equipped as standard.  
(6) Frame size 90L or less motors are not equipped with eye bolts.  
(7) The following models are not equipped with baffle plate; 2-Pole: 22, 30kW, 4-Pole: 18.5, 22, 30, 37, 45kW, 6-Pole: 15, 18.5, 22, 30, 45kW.







# Outdoor Use/ Totally Enclosed Fan Cooled/ Foot Mounted 0.75kW~55kW

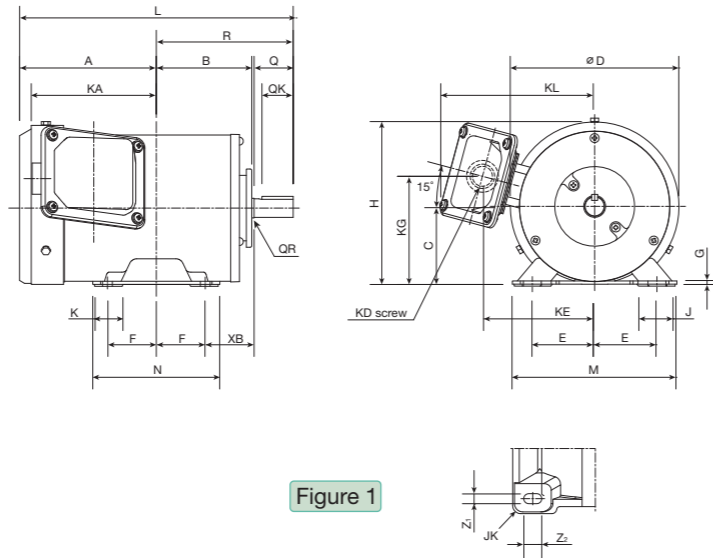


Figure 1

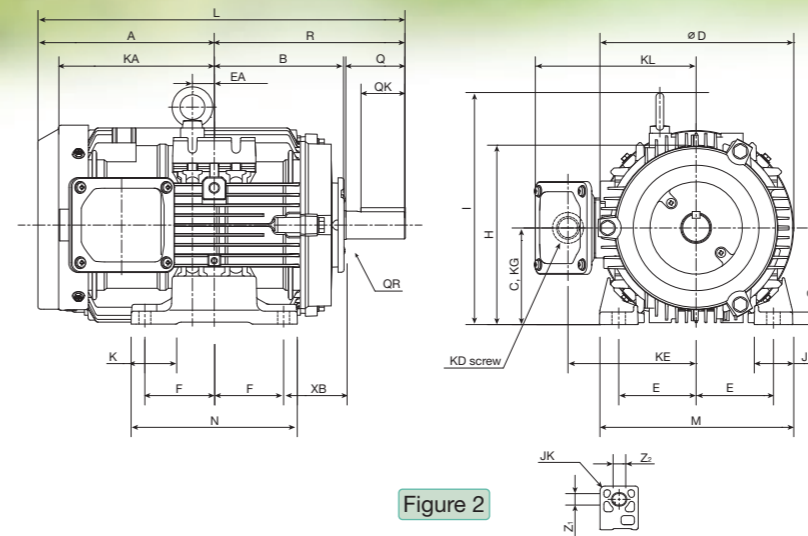


Figure 2

Shared Shaft End

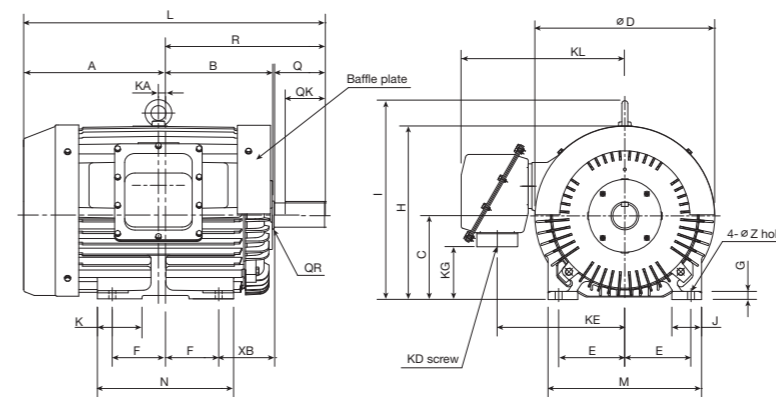
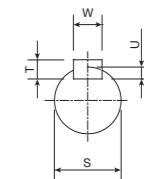


Figure 3

TYPE & FORM	Frame size	Output (kW)			Figure No.	Dimensions (mm)																		Terminal box								Shaft end								Bearing No.				Approx. weight (kg)			Frame size
		2-Pole	4-Pole	6-Pole		A	B	C	D	E	F	G	H	I	J	K	L	M	N	R	Z (Z <sub>1</sub> ×Z <sub>2</sub> )	XB	JK	EA	EL	KA	KD	KE	KG	KL	Q	QK	QR	S	W	T	U	2-Pole		Over 4poles		2-Pole	4-Pole	6-Pole			
		Drive end	Non drive end	Drive end		Non drive end	Drive end	Non drive end	Drive end	Non drive end	Drive end	Non drive end	Drive end	Non drive end	Drive end	Non drive end	Drive end	Non drive end	Drive end	Non drive end	Drive end	Non drive end	Drive end	Non drive end	Drive end	Non drive end	Drive end	Non drive end	Drive end	Non drive end	Drive end	Non drive end	Drive end	Non drive end	Drive end	Non drive end	Drive end	Non drive end	Drive end	Non drive end							
IKH3-FCKAW21E/ FBKAW21E	80M	0.75	—	—	1	122	98	80	170	62.5	50	4.5	165	—	35	30	262	165	130	140	10×8	50	8	—	—	109	G3/4 (22)	113	—	158	40	32	0.5	19	6	6	3.5	6204C3	6204C3	—	—	12	—	—	80M		
		—	0.75	—		140	—	—	—	—	—	—	—	—	—	—	—	—	280	—	—	—	—	—	—	—	127	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
Up to 3.7kW IKH3-FCKAW21E/ FBKAW21E	90L	1.5	1.5	0.75	2	154.5	116.5	90	202	70	62.5	10	191	—	40	40	323	176	149	168.5	10×12	56	5	—	—	133	G3/4 (22)	132.5	—	167.5	50	40	0.5	24	8	7	4	6205C3	6205C3	6205C3	6205C3	18.5	22	18.5	90L		
	100L	—	2.2	—		178	131	100	202	80	70	12	201	239.5	40	46	371	200	168	193	12×14	63	5	22	37.5	156.5	G3/4 (22)	132.5	—	167.5	60	45	0.5	28	8	7	4	—	—	6206C3	6205C3	—	—	30	—	—	100L
	112M	3.7	3.7	—		207	138	112	243	95	70	12	233.5	263.5	40	44	400	220	168	200	12×14	70	5	23	47	158	G3/4 (22)	151.5	—	186.5	60	45	1.5	28	8	7	4	6207C3	6206C3	6207C3	6206C3	34	40	—	112M		
Up to 11kW IKH3-FCKAW21E/ FBKAW21E	132S	5.5	5.5	3.7	2	210.5	156	132	285	108	70	15	274.5	313	50	50	386	260	175	239	12×14	89	5	24	61	196	G1 1/2 (42)	201.5	—	263	80	63	0.5	38	10	8	5	6308C3	6208C3	6308C3	6208C3	56	60	60	132S		
	132S	7.5	—	—		219	—	—	—	—	—	—	—	—	—	—	419	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—			
15kW and over TKKH3-FCKAW21E/ FBKAW21E	132M	—	7.5	5.5	2	229.5	175	132	285	108	89	15	274.5	313	50	50	419	260	213	258	12×14	89	5	24	61	215	G1 1/2 (42)	201.5	—	263	80	63	0.5	38	10	8	5	—	—	6308C3	6208C3	—	—	72	75	132M	
	160M	11	11	7.5		290	210	160	324	127	105	18	322	365.5	60	60	613	308	250	323	14.5×18.5	108	5	22	54	237	G1 1/2 (42)	221.5	—	282.5	110	90	2	42	12	8	5	6310C3	6208C3	6310C3	6208C3	93	104	103	97	160M	
	160L	18.5	15	11		268	232	160	324	127	127	18	322	365.5	60	60	613	308	294	345	14.5×18.5	108	5	—	54	215	G1 1/2 (42)	221.5	—	282.5	110	90	2	42	12	8	5	—	—	6310C3	6208C3	—	—	117	120	117	160L
TKKH3-FCKAW21E/ FBKAW21E	180M	22	18.5	15	3	287	237.5	180	391	139.5	120.5	20	375.5	434	60	82.5	638.5	324	286	351.5	14.5	121	—	—	—	—	G3 (82)	293	82	390	110	90	0.5	48	14	9	5.5	6212C3	6310C3	6310C3	6310C3	195	185	175	180M		
	180L	30	30	18.5		346	266.5	180	391	139.5	139.5	20	375.5	434	60	82.5	716.5	324	324	370.5	14.5	121	—	—	—	—	G3 (82)	293	82	390	110	90	1.5	55	16	10	6	6212C3	6310C3	6312C3	6310C3	235	235	215	230	180L	
	200L	37	—	—		394	281.5	200	441	159	152.5	20	420	478	80	100	789.5	378	360	395.5	18.5	133	—	—	—	—	40	G3 (82)	313	112	410	110	90	1.5	55	16	10	6	6312C3	6312C3	—	—	325	—	—	200L	
		45	—	—		819.5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—					
	225S	55	—	—		381	288	225	484	178	143	22	467	535	80	120	783	413	366	402	18.5	149	—	—	—	—	19	G3 (82)	343	142	440	110	90	1.5	55	16	10	6	6312C3	6312C3	—	—	400	—	—	225S	
225S	—	55	45	813	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		

(1) Tolerance of "C" dimensions is 0 ~ -0.5.  
(2) Tolerance of "S" is defined by JIS B 0401 (dimensional tolerance);  $\phi 19$ -28mm: j6,  $\phi 38$ -48mm: k6,  $\phi 55$ mm or longer: m6.  
(3) Shaft end key and keyway follow parallel key and keyway of JIS B 1301. Dimensional tolerance of the keyway is standard type (N9).  
(4) The followings are standard drive systems; 2-Pole: direct-coupled, 4-Pole: belt-driven. Please contact us for more information about belt application.  
(5) Sealed ball bearing is equipped as standard.  
(6) Frame size 90L or less motors are not equipped with eye bolts.  
(7) The following models are not equipped with baffle plate; 2-Pole: 22, 30kW, 4-Pole: 18.5, 22, 30, 37, 45kW, 6-Pole: 15, 18.5, 22, 30, 45kW.





# Indoor Use/Totally Enclosed Fan Cooled/ Foot Mounted Flange 0.75kW~55kW

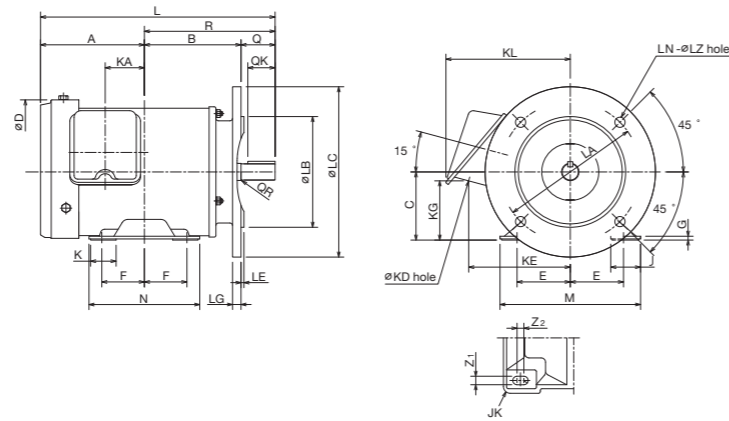


Figure 1

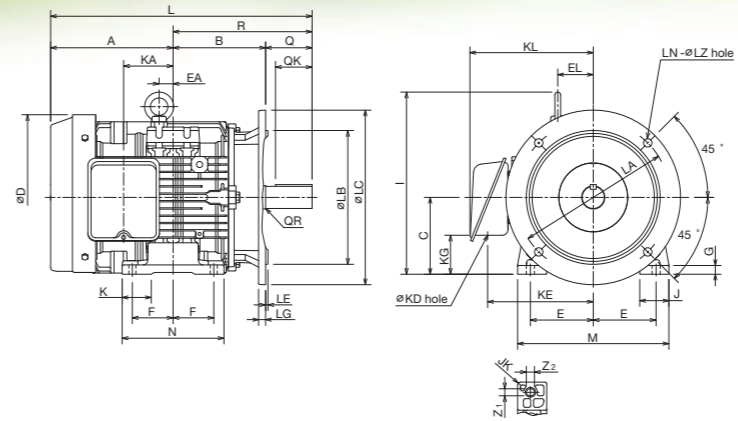


Figure 2

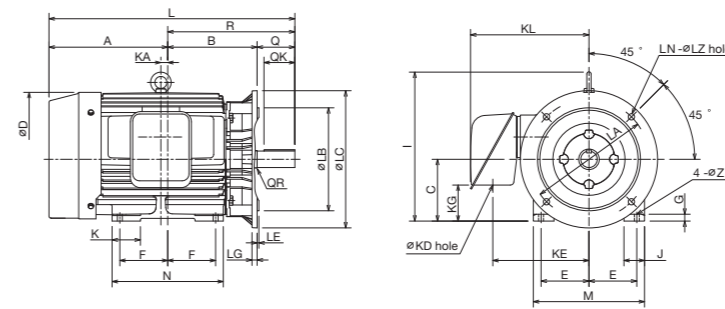
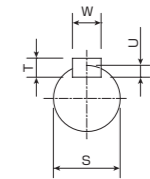


Figure 3

Shared Shaft End

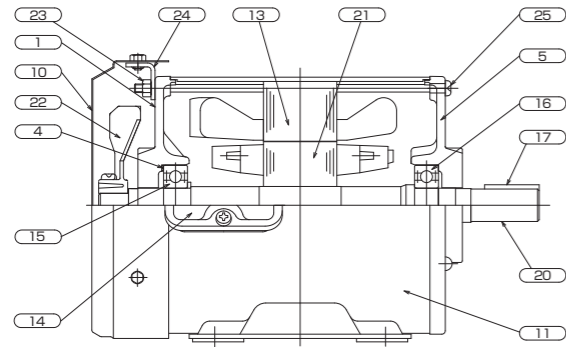


TYPE & FORM	Flange size	Output (kW)			Figure No.	Dimensions (mm)																					Bearing No.				Approx. weight (kg)			Flange size																			
		2-Pole	4-Pole	6-Pole		A	B	C	D	E	F	G	H	I	J	K	L	M	N	R	Z (Z1×Z2)	JK	EA	EL	Terminal box		Flange				Shaft end				2-Pole		Over 4poles		2-Pole	4-Pole	6-Pole												
		KA	KD	KE		KG	KL	LA	LB	LC	LE	LG	LN	LZ	Q	QK	QR	S	W	T	U	Drive end	Non drive end	Drive end	Non drive end	2-Pole	4-Pole	6-Pole																									
IKH3-FCKLK21E	80M	0.75	—	—	1	122	113.5	80	170	62.5	50	4.5	165	—	35	30	275.5	165	130	153.5	10x8	8	—	—	46	22	121	69	146	165	130	200	3.5	10	4	12	40	32	0.5	19	6	6	3.5	6204C3	6204C3	—	—	14.5	—	—	80M		
		—	0.75	—		140	118.5	90	170	62.5	50	4.5	165	—	35	30	280	176	149	168.5	10x8	5	—	—	64	27	129.5	49	156	165	130	200	3.5	10	4	12	40	32	0.5	19	6	6	3.5	—	—	6204C3	6204C3	—	—	18.5		—	
Up to 3.7kW IKH3-FCKLA21E	90L	1.5	1.5	0.75	2	154.5	118.5	90	202	70	62.5	10	191	—	40	40	323	176	149	168.5	10x12	5	—	—	70	27	129.5	49	156	165	130	200	3.5	10	4	12	50	40	0.5	24	8	7	4	6205C3	6205C3	6205C3	6205C3	21	24	21	90L		
	100L	—	2.2	—		178	133	100	202	80	70	12	201	239.5	40	46	371	200	168	193	12x14	5	22	37.5	93.5	27	129.5	59	156	215	180	250	4	16	4	14.5	60	45	0.5	28	8	7	4	—	—	6206C3	6205C3	—	—	34		—	100L
	112M	3.7	3.7	—		207	140	112	243	95	70	12	233.5	263.5	40	44	400	220	168	200	12x14	5	23	47	95	27	148.5	71	175	215	180	250	4	13	4	14.5	60	45	1.5	28	8	7	4	6207C3	6206C3	6207C3	6206C3	38	44	—		112M	
Up to 11kW IKKH3-FCKLA21E	132S	5.5	5.5	3.7	2	210.5	159	132	285	108	70	15	274.5	313	50	50	386	220	168	200	12x14	5	24	61	95	27	148.5	71	175	215	180	250	4	13	4	14.5	60	45	1.5	28	8	7	4	6207C3	6206C3	6207C3	6206C3	38	44	—	112M		
	132S	7.5	5.5	3.7		219	140	112	243	95	70	12	233.5	263.5	40	44	419	220	168	200	12x14	5	23	47	95	27	148.5	71	175	215	180	250	4	13	4	14.5	60	45	1.5	28	8	7	4	6207C3	6206C3	6207C3	6206C3	38	44	—		112M	
	132S	5.5	5.5	3.7		219	140	112	243	95	70	12	233.5	263.5	40	44	419	220	168	200	12x14	5	23	47	95	27	148.5	71	175	215	180	250	4	13	4	14.5	60	45	1.5	28	8	7	4	6207C3	6206C3	6207C3	6206C3	38	44	—			112M
15kW and over TKKH3-FCKLA21E	132M	—	7.5	5.5	2	210.5	159	132	285	108	70	15	274.5	313	50	50	449.5	260	175	239	12x14	5	24	61	85	35	181.5	67	212	265	230	300	4	12	4	14.5	80	63	0.5	38	10	8	5	6308C3	6208C3	6308C3	6208C3	60	64	65	132S		
	132M	—	7.5	5.5		219	140	112	243	95	70	12	233.5	263.5	40	44	419	220	168	200	12x14	5	23	47	85	35	181.5	67	212	265	230	300	4	12	4	14.5	80	63	0.5	38	10	8	5	6308C3	6208C3	6308C3	6208C3	60	64	65		132S	
	132M	—	7.5	5.5		219	140	112	243	95	70	12	233.5	263.5	40	44	419	220	168	200	12x14	5	23	47	85	35	181.5	67	212	265	230	300	4	12	4	14.5	80	63	0.5	38	10	8	5	6308C3	6208C3	6308C3	6208C3	60	64	65			132S
TKKH3-FCKL21E	180M	22	18.5	15	3	287	241.5	180	391	139.5	120.5	20	375.5	434	60	82.5	638.5	324	286	351.5	14.5	—	—	—	—	91	280	105	345	350	300	400	5	15	4	18.5	110	90	0.5	48	14	9	5.5	6212C3	6310C3	6310C3	6310C3	205	195	185	180M		
	180L	30	30	18.5		346	260.5	180	391	139.5	139.5	20	375.5	434	60	82.5	716.5	324	324	370.5	14.5	—	—	—	—	20	91	280	105	345	350	300	400	5	15	4	18.5	110	90	1.5	55	16	10	6	6212C3	6310C3	6312C3	6310C3	245	245		225	180L
	180L	30	30	18.5		346	260.5	180	391	139.5	139.5	20	375.5	434	60	82.5	716.5	324	324	370.5	14.5	—	—	—	—	20	91	280	105	345	350	300	400	5	15	4	18.5	110	90	1.5	55	16	10	6	6212C3	6310C3	6312C3	6310C3	245	245		225	
200L	37	—	—	3	394	285.5	200	441	159	152.5	20	420	478	80	100	789.5	378	360	395.5	18.5	—	—	—	—	40	91	300	135	365	400	350	450	5	19	8	18.5	110	90	1.5	55	16	10	6	6312C3	6312C3	—	—	340	—	—	200L		
	45	—	—		394	285.5	200	441	159	152.5	20	420	478	80	100	819.5	378	360	425.5	18.5	—	—	—	—	40	91	300	135	365	400	350	450	5	19	8	18.5	140	110	1.5	60	18	11	7	—	—	6313C3	6312C3	—	—	345		355	200L
	45	—	—		394	285.5	200	441	159	152.5	20	420	478	80	100	819.5	378	360	425.5	18.5	—	—	—	—	40	91	300	135	365	400	350	450	5	19	8	18.5	140	110	1.5	60	18	11	7	—	—	6313C3	6312C3	—	—	380		360	
225S	55	—	—	3	381	306.5	225	484	178	143	22	467	535	80	120	797.5	413	366	416.5	18.5	—	—	—	—	19	91	343	180	440	500	450	550	5	22	8	18.5	110	90	1.5	55	16	10	6	6312C3	6312C3	—	—	430	—	—	225S		
	55	—	—		381	306.5	225	484	178	143	22	467	535	80	120	827.5	413	366	446.5	18.5	—	—	—	—	19	91	343	180	440	500	450	550	5	22	8	18.5	140	110	1.5	65	18	11	7	—	—	6315C3	6312C3	—	—	460		445	225S

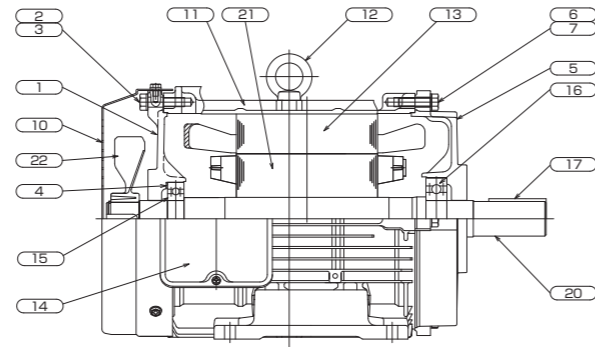
(1) Tolerance of "C" dimensions is 0~0.5. (2) Tolerance of "S" is defined by JIS B 0401(dimensional tolerance); φ19~28mm:j6, φ38~48mm:k6, φ55mm or longer:m6.  
(3) Shaft end key and keyway follow parallel key and keyway of JIS B 1301. Dimensional tolerance of the keyway is standard type (N9).  
(4) Tolerance of "LB" dimension is j6 of JIS B 0401. (5) Sealed ball bearing (greased sealed method) is equipped as standard.  
(6) Frame size 80M motors are not equipped with eyebolts.

# Structural drawing

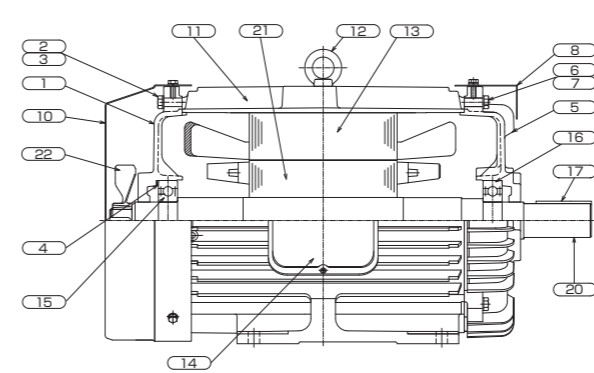
① Indoor use/Steel sheet frame  
Foot mounted/Horizontal (Fr.80M)



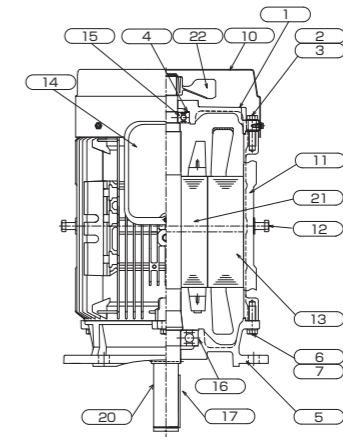
② Indoor use/Aluminum die-cast frame  
Foot mounted/Horizontal (Fr.90L~Fr.160L)



③ Indoor use/Cast iron frame  
Foot mounted/Horizontal (Fr.180M~Fr.225S)

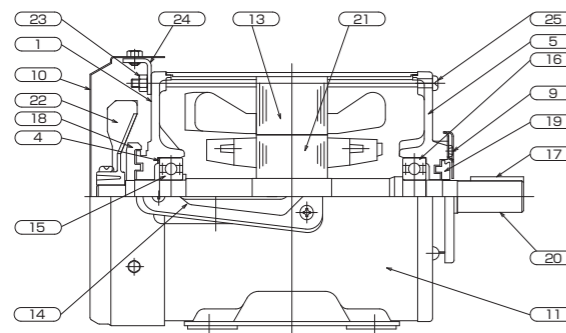


④ Indoor use/Aluminum die-cast frame  
Flange mounted/Vertical shaft down  
(Fr.90L~160L)

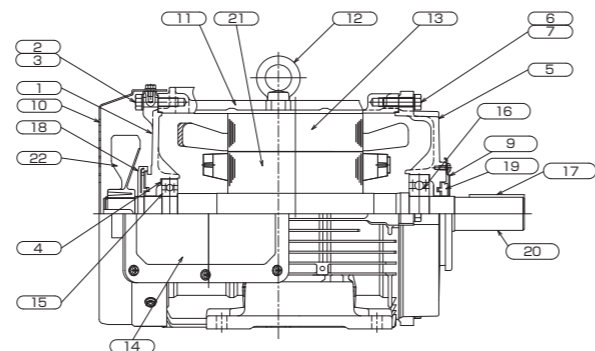


Parts number	Parts name
1	Bearing bracket
2	Hexagon bolt
3	Washer
4	Wave washer
5	Bearing bracket
6	Hexagon bolt
7	Washer
8	Guide plate
9	Cover
10	Fan cover
11	Frame
12	Eyebolt or Fook
13	Stator core
14	Terminal box
15	Bearing
16	Bearing
17	Key
18	Labyrinth collar
19	Labyrinth collar
20	Shaft
21	Rotor core
22	fan
23	Hexagon nut
24	Support plate
25	Screw with cross hole

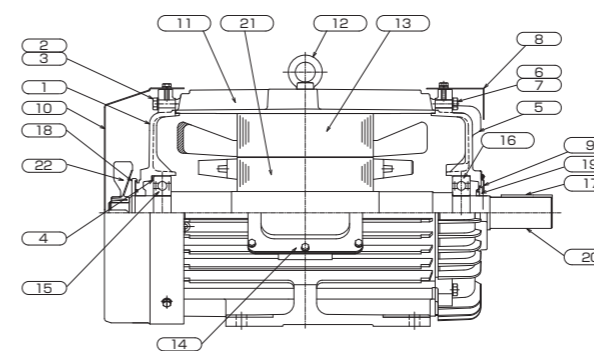
⑤ Outdoor use/Steel sheet frame  
Foot mounted/Horizontal (Fr.80M)



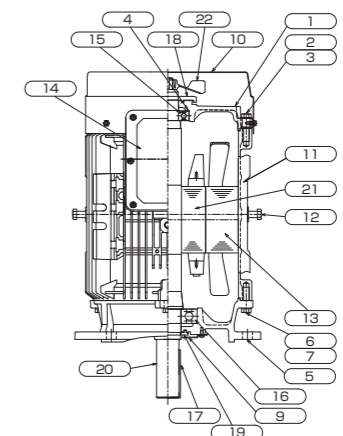
⑥ Outdoor use/Aluminum die-cast frame  
Foot mounted/Horizontal (Fr.90L~Fr.160L)



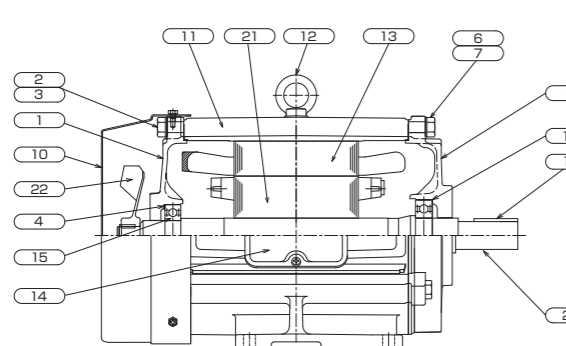
⑦ Outdoor use/Cast iron frame  
Foot mounted/Horizontal (Fr.180M~Fr.225S)



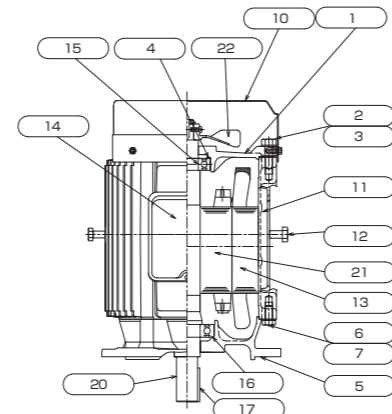
⑧ Outdoor use/Aluminum die-cast frame  
Flange mounted/Vertical shaft down  
(Fr.90L~160L)



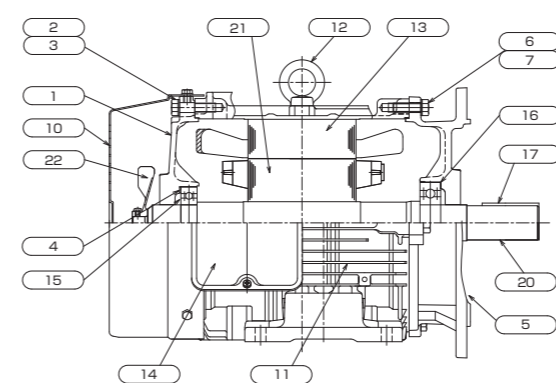
⑨ Indoor use/Cast iron frame  
Foot mounted/Horizontal (Fr.80M~160L)



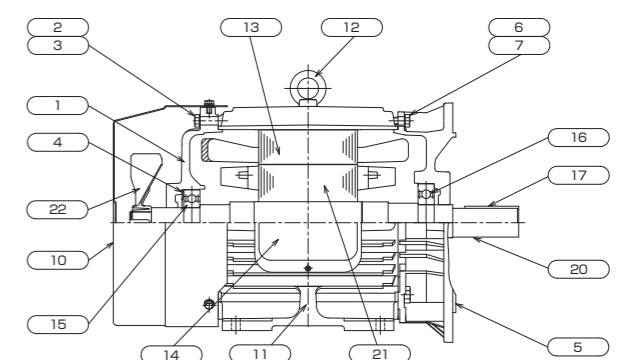
⑩ Indoor use/Cast iron frame  
Flange mounted/Vertical shaft down  
(Fr.80M~160L)



⑪ Indoor use/Aluminum die-cast frame  
Foot mounted flange/Horizontal (Fr.90L~Fr.160L)



⑫ Indoor use/Cast iron frame  
Foot mounted flange/Horizontal (Fr.180M~Fr.225S)



## Dimensions of standard terminal box

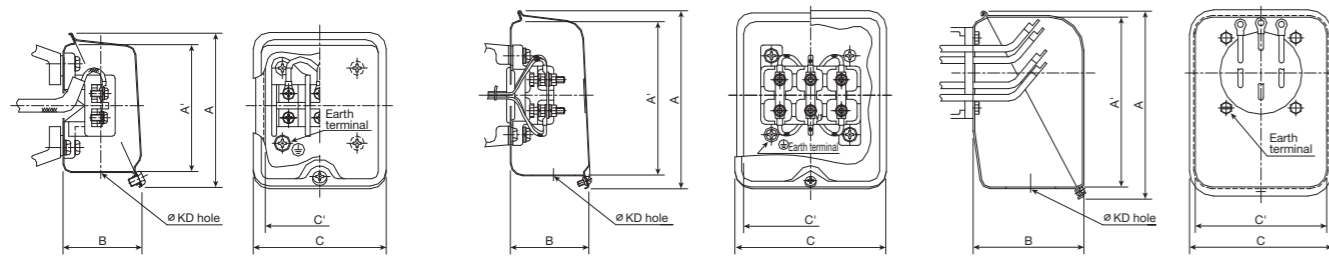


Figure 1

Figure 2

Figure 3

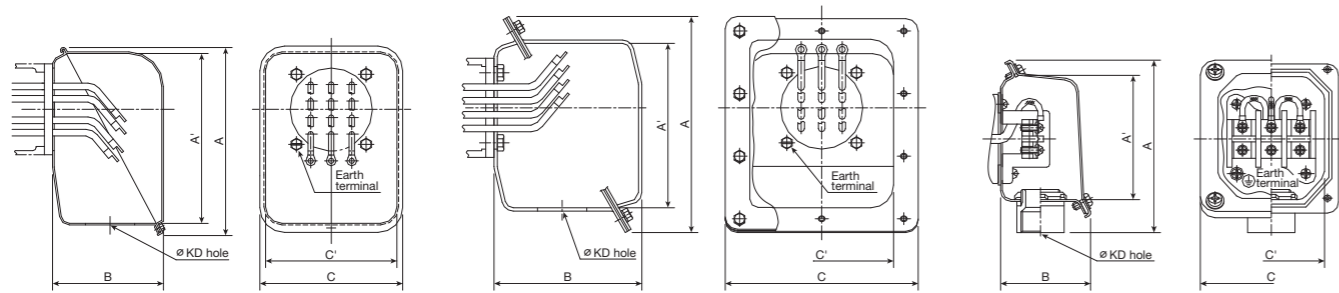


Figure 4

Figure 5

Figure 6

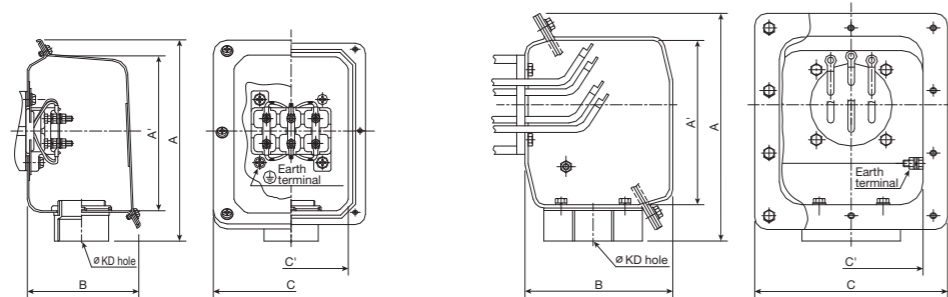


Figure 7

Figure 8

### <Indoor use>

Frame size	Figure No.	Standard dimensions (mm)						Screw size of grounding terminal	Terminal block screw or crimp type terminal lugs size	
		A	A'	B	C	C'	∅KD		200V	400V
80M~112M	1	97	80	50	83	68	22, 27	M5	M4	
132S, M	2	143	125	65	123	108	35	M6	M5	
160M, L	2	173	150	112	142	123	52	M6	M5	
180M	3	225.5	203.5	135	174	160	91	M8	M6	
180L	3, 4	225.5	203.5	135	174	160	91	M8	M8	
200L									※1	
225S	5	263	201	180	235	175	91	M8	※1	

※1 37kW or less : M6  
45,55kW : 400V standard model is M8, Customized model is M6.

### <Outdoor use>

Frame size	Figure No.	Standard dimensions (mm)						Screw size of grounding terminal	Terminal block screw or crimp type terminal lugs size	
		A	A'	B	C	C'	∅KD		200V	400V
80M~112M	6	116	83	62	96	72	G3/4(22)	M5	M4	
132S~160L	7	203	155	116	158	116	G1 1/2(42)	M6	M5	
180M, 180L	8	278	201	180	235	175	G3(82)	M8	M6	
200L, 225S									※2	

※2 37kW or less : M6  
45,55kW : 400V standard model is M8, Customized model is M6.

## Wiring

- Please comply with electric installation engineering standards, interior wiring regulations, and regulation by power companies. If wiring distance is too long, voltage drops greatly and motors may not be able to start operating. Please ensure voltage drop in wiring is within 2%.
- The followings show standard connections of motor's lead wire.

Number of terminals for lead wire	Connection method of lead wire			
3	Frame size 80M~112M			
6	Frame size 132S~160L	Frame size Over 180M		
	<p>*When connected to a wye-delta starter, please take off the short circuit board.</p> <p>(6P-3.7kW is direct-on-line starting.)</p>	<p>To wye-delta starter</p> <p>To electric power source</p>		
12	Common for 200V class/400V class			
	Direct-on-line starting		Wye-delta starting	
	200V class	400V class	200V class	400V class
<p>Marked terminal (Lead wire draw out point)</p>				

### 3. Precautions for use of wye-delta starting

Please ensure turning off power switch in 2 contactors method if using wye-delta starting.

If the switch is turned on, motors keep being supplied with voltage, which may cause deterioration of motor's insulation or burnout. It doesn't happen in 3 contactors method.

## Electrical characteristics (2-Pole)

<200V>

Output [kW]	Voltage [V]	Frequency [Hz]	Rated current [A]	Rated speed [min <sup>-1</sup> ]	Load characteristics									Starting current [A]	Starting torque [%]	Maximum torque [%]	Efficiency level (IE code)
					50% load			75% load			100% load						
					Current [A]	Efficiency [%]	Power factor [%]	Current [A]	Efficiency [%]	Power factor [%]	Current [A]	Energy consumption efficiency [%]	Power factor [%]				
0.75	200	50	3.20	2870	2.05	79.6	66.5	2.51	81.4	79.5	3.09	80.8	86.7	20.4	229	301	IE3
	200	60	3.00	3445	1.75	81.4	75.9	2.29	82.7	85.8	2.94	81.6	90.3	19.0	185	246	
	220	60	2.80	3480	1.80	81.1	67.5	2.23	83.3	79.5	2.75	83.2	86.1	20.9	224	298	
1.5	200	50	6.00	2890	3.47	88.2	70.7	4.57	87.4	81.4	5.81	86.4	86.3	46.0	285	358	IE3
	200	60	5.80	3460	3.16	86.5	79.2	4.35	86.6	86.2	5.68	85.5	89.2	40.0	224	300	
	220	60	5.40	3485	3.13	86.1	73.0	4.12	87.1	82.2	5.25	86.4	86.7	44.0	271	363	
2.2	200	50	8.60	2875	4.96	89.5	71.6	6.55	89.1	81.7	8.42	87.3	86.4	76.6	330	309	IE3
	200	60	8.40	3445	4.48	89.1	79.5	6.23	88.4	86.5	8.21	86.6	89.4	68.0	260	262	
	220	60	7.60	3480	4.41	89.0	73.5	5.86	89.3	82.7	7.49	88.4	87.2	74.8	315	317	
3.7	200	50	13.6	2910	7.42	90.1	79.8	10.2	89.9	87.7	13.2	88.7	91.4	112	244	336	IE3
	200	60	13.2	3490	6.84	90.2	86.6	9.73	89.9	91.6	12.9	88.6	93.4	96.0	197	277	
	220	60	12.2	3515	6.61	90.4	81.3	9.08	90.7	88.4	11.8	90.0	91.5	106	238	335	
5.5	200	50	20.4	2920	11.3	90.9	77.5	15.3	90.8	85.6	19.8	90.0	89.2	146	282	347	IE3
	200	60	19.8	3500	10.3	90.5	84.8	14.7	90.3	89.9	19.3	89.5	91.8	123	223	277	
	220	60	18.2	3520	10.1	90.7	78.9	13.7	90.9	87.0	17.7	90.7	90.1	135	270	335	
7.5	200	50	28.2	2920	16.5	91.3	71.7	21.7	91.4	81.8	27.6	90.7	86.5	218	334	398	IE3
	200	60	27.0	3505	14.3	91.7	82.6	20.0	91.6	88.8	26.3	90.7	90.8	181	269	326	
	220	60	25.0	3525	14.2	91.3	75.9	19.0	91.8	84.6	24.3	91.5	88.5	199	325	394	
11	200	50	41.0	2940	22.9	91.9	75.4	30.7	92.2	84.3	39.3	91.9	87.9	282	243	326	IE3
	200	60	40.2	3520	20.7	91.4	83.8	29.2	91.6	89.1	38.5	91.0	90.7	236	202	270	
	220	60	36.8	3540	20.2	91.5	78.1	27.3	92.2	85.9	35.4	92.1	88.5	260	244	327	
15	200	50	56.0	2940	32.3	92.4	72.5	42.8	92.7	81.9	54.5	92.2	86.2	438	268	377	IE3
	200	60	53.8	3525	28.3	92.2	83.1	39.6	92.5	88.6	52.1	92.0	90.4	364	220	311	
	220	60	49.8	3540	27.8	92.1	76.8	37.5	92.8	84.9	48.2	92.6	88.2	400	266	376	
18.5	200	50	68.8	2940	39.0	92.8	73.8	52.3	93.2	82.3	67.0	92.6	86.1	580	300	410	IE3
	200	60	66.8	3525	34.9	92.0	83.3	49.3	92.4	88.0	65.0	91.7	89.6	490	245	334	
	220	60	61.4	3540	34.0	91.9	77.7	46.3	92.7	84.8	59.8	92.5	87.8	539	296	404	
22	200	50	81.4	2960	47.3	92.7	72.5	62.4	93.5	81.7	79.2	93.3	85.9	752	260	390	IE3
	200	60	78.2	3550	41.8	92.6	82.0	58.2	93.2	87.7	76.1	92.9	89.8	640	219	320	
	220	60	72.4	3560	41.0	92.6	76.1	55.2	93.6	83.9	70.5	93.6	87.5	704	265	387	
30	200	50	116	2970	75.2	92.2	62.4	93.1	93.5	74.7	114	93.8	81.2	1260	315	471	IE3
	200	60	105	3560	59.1	92.8	78.9	80.2	93.7	86.4	103	93.7	89.7	1040	256	383	
	220	60	98.0	3570	61.0	92.3	70.0	78.7	93.6	80.1	98.1	93.9	85.4	1144	310	463	
37	200	50	136	2965	81.6	93.4	70.1	107	94.1	79.7	135	94.1	84.3	1310	336	409	IE3
	200	60	130	3560	72.2	92.8	79.6	99.0	93.7	86.4	128	93.7	88.9	1090	286	330	
	220	60	121	3565	71.7	92.6	73.1	94.5	93.8	82.2	120	94.0	86.2	1199	346	399	
45	200	50	167	2965	100	93.1	69.8	131	94.0	79.2	165	94.0	83.7	1710	283	351	IE3
	200	60	158	3555	86.6	92.8	80.8	120	93.7	86.6	156	93.7	88.8	1420	241	286	
	220	60	147	3565	86.0	92.6	74.2	114	93.9	82.4	146	94.2	86.1	1562	292	346	
55	200	50	198	2965	113	94.1	74.6	151	94.8	83.0	193	94.8	86.6	1800	272	364	IE3
	200	60	192	3560	103	93.4	82.8	143	94.3	88.1	188	94.3	89.8	1550	237	297	
	220	60	178	3565	99.2	93.3	77.9	135	94.4	85.0	173	94.7	88.0	1705	287	359	

<400V>

Output [kW]	Voltage [V]	Frequency [Hz]	Rated current [A]	Rated speed [min <sup>-1</sup> ]	Load characteristics									Starting current [A]	Starting torque [%]	Maximum torque [%]	Efficiency level (IE code)
					50% load			75% load			100% load						
					Current [A]	Efficiency [%]	Power factor [%]	Current [A]	Efficiency [%]	Power factor [%]	Current [A]	Energy consumption efficiency [%]	Power factor [%]				
0.75	400	50	1.60	2870	1.02	79.6	66.5	1.25	81.4	79.5	1.55	80.8	86.7	10.2	229	301	IE3
	400	60	1.50	3445	0.88	81.4	75.9	1.15	82.7	85.8	1.47	81.6	90.3	9.50	185	246	
	440	60	1.40	3480	0.90	81.1	67.5	1.12	83.3	79.5	1.37	83.2	86.1	10.5	224	298	
1.5	400	50	3.00	2890	1.74	88.2	70.7	2.28	87.4	81.4	2.90	86.4	86.3	23.0	285	358	IE3
	400	60	2.90	3460	1.58	86.5	79.2	2.17	86.6	86.2	2.84	85.5	89.2	20.0	224	300	
	440	60	2.70	3485	1.57	86.1	73.0	2.06	87.1	82.2	2.63	86.4	86.7	22.0	271	363	
2.2	400	50	4.30	2875	2.48	89.5	71.6	3.27	89.1	81.7	4.21	87.3	86.4	38.3	330	309	IE3
	400	60	4.20	3445	2.24	89.1	79.5	3.12	88.4	86.5	4.11	86.6	89.4	34.0	260	262	
	440	60	3.80	3480	2.21	89.0	73.5	2.93	89.3	82.7	3.75	88.4	87.2	37.4	315	317	
3.7	400	50	6.80	2910	3.71	90.1	79.8	5.08	89.9	87.7	6.59	88.7	91.4	56.0	244	336	IE3
	400	60	6.60	3490	3.42	90.2	86.6	4.87	89.9	91.6	6.46	88.6	93.4	48.0	197	277	
	440	60	6.10	3515	3.30	90.4	81.3	4.54	90.7	88.4	5.89	90.0	91.5	52.8	238	335	
5.5	400	50	10.2	2920	5.64	90.9	77.5	7.67	90.8	85.6	9.89	90.0	89.2	73.0	282	347	IE3
	400	60	9.90	3500	5.17	90.5	84.8	7.33	90.3	89.9	9.66	89.5	91.8	61.5	223	277	
	440	60	9.10	3520	5.04	90.7	78.9	6.85	90.9	87.0	8.83	90.7	90.1	67.7	270	335	
7.5	400	50	14.1	2920	8.26	91.3	71.7	10.9	91.4	81.8	13.8	90.7	86.5	109	334	398	IE3
	400	60	13.5	3505	7.15	91.7	82.6	9.98	91.6	88.8	13.1	90.7	90.8	90.5	269	326	
	440	60	12.5	3525	7.10	91.3	75.9	9.50	91.8	84.6	12.2	91.5	88.5	99.6	325	394	
11	400	50	20.5	2940	11.5	91.9	75.4	15.3	92.2	84.3	19.7	91.9	87.9	141	243	326	IE3
	400	60	20.1	3520	10.4	91.4	83.8	14.6	91.6	89.1	19.2	91.0	90.7	118	202	270	
	440	60	18.4	3540	10.1	91.5	78.1	13.7	92.2	85.9	17.7	92.1	88.5	130	244	327	
15	400	50	28.0	2940	16.2	92.4	72.5	21.4	92.7	81.9	27.2	92.2	86.2	219	268	377	IE3
	400	60	26.9	3525	14.1	92.2	83.1	19.8	92.5	88.6	26.0	92.0	90.4	182	220	311	
	440	60	24.9	3540	13.9	92.1	76.8	18.8	92.8	84.9	24.1	92.6	88.2	200	266	376	
18.5	400	50	34.4	2940	19.5	92.8	73.8	26.1	93.2	82.3	33.5	92.6	86.1	290	300	410	IE3
	400	60	33.4	3525	17.4	92.0	83.3	24.6	92.4	88.0	32.5	91.7	89.6	245	245	334	
	440	60	30.7	3540	17.0	91.9	77.7	23.2	92.7	84.8	29.9	92.5	87.8	270	296	404	
22	400	50	40.7	2960	23.6	92.7	72.5	31.2	93.5	81.7	39.6	93.3	85.9	376	260	390	IE3
	400	60	39.1	3550	20.9	92.6	82.0	29.1	93.2	87.7	38.0	92.9	89.8	320	219	320	
	440	60	36.2	3560	20.5	92.6	76.1	27.6	93.6	83.9	35.3	93.6	87.5	352	265	387	
30	400	50	58.0	2970	37.6	92.2	62.4	46.5	93.5	74.7	56.9	93.8	81.2	630	315	471	IE3
	400	60	52.5	3560	29.6	92.8	78.9	40.1	93.7	86.4	51.5	93.7	89.7	520	256	383	
	440	60	49.0	3570	30.5	92.3	70.0	39.4	93.6	80.1	49.1	93.9	85.4	572	310	463	
37	400	50	68.0	2965	40.8	93.4	70.1	53.4	94.1	79.7	67.3	94.1	84.3	655	336	409	IE3
	400	60	65.0	3560	36.1	92.8	79.6	49.5	93.7	86.4	64.2	93.7	88.9	545	286	330	
	440	60	60.5	3565	35.8												



# Electrical characteristics (4-Pole)

<200V>

Output [kW]	Voltage [V]	Frequency [Hz]	Rated current [A]	Rated speed [min <sup>-1</sup> ]	Load characteristics									Starting current [A]	Starting torque [%]	Maximum torque [%]	Efficiency level (IE code)
					50% load			75% load			100% load						
					Current [A]	Efficiency [%]	Power factor [%]	Current [A]	Efficiency [%]	Power factor [%]	Current [A]	Energy consumption efficiency [%]	Power factor [%]				
0.75	200	50	3.80	1440	2.81	81.4	47.2	3.21	83.2	60.8	3.71	83.4	70.0	27.3	398	499	IE3
	200	60	3.40	1730	2.34	84.9	54.6	2.79	85.9	67.7	3.36	85.5	75.5	23.8	312	412	
	220	60	3.40	1745	2.49	83.3	47.5	2.85	85.4	60.7	3.31	85.6	69.5	26.2	378	499	
1.5	200	50	6.80	1445	4.62	85.7	54.7	5.52	86.7	67.8	6.65	86.0	75.8	46.6	275	319	IE3
	200	60	6.40	1740	3.82	87.5	64.7	4.89	87.8	75.6	6.16	86.6	81.2	41.0	215	270	
	220	60	6.00	1750	4.01	86.9	56.4	4.86	88.2	68.9	5.88	87.8	76.3	45.1	260	327	
2.2	200	50	10.6	1460	7.88	86.4	46.7	9.02	88.3	59.8	10.4	88.6	69.1	96.0	410	475	IE3
	200	60	9.40	1755	6.17	88.6	58.0	7.54	89.8	70.3	9.15	89.7	77.4	81.0	325	386	
	220	60	9.20	1765	6.69	87.5	49.3	7.77	89.5	62.3	9.08	89.9	70.7	89.1	393	467	
3.7	200	50	15.6	1460	10.3	88.9	58.2	12.6	89.8	70.8	15.3	89.4	77.9	134	320	415	IE3
	200	60	14.6	1755	8.55	90.1	69.4	11.2	90.4	79.2	14.2	89.6	83.6	118	259	358	
	220	60	13.8	1765	8.84	89.7	61.2	11.0	90.7	73.2	13.5	90.5	79.5	130	313	433	
5.5	200	50	23.4	1465	15.8	89.9	55.9	19.0	91.0	69.0	22.8	90.8	76.6	200	340	403	IE3
	200	60	21.4	1760	12.9	91.4	67.1	16.6	92.1	77.7	21.0	91.7	82.6	166	279	328	
	220	60	20.6	1765	13.5	90.8	58.9	16.5	92.0	71.3	20.1	92.0	78.2	183	338	397	
7.5	200	50	30.8	1460	20.1	90.8	59.3	24.7	91.6	71.7	30.2	91.2	78.6	264	345	411	IE3
	200	60	28.6	1755	16.7	92.0	70.5	22.0	92.3	80.0	28.0	91.7	84.2	218	280	330	
	220	60	27.4	1765	17.2	91.6	62.5	21.6	92.5	74.0	26.6	92.4	80.1	240	339	399	
11	200	50	46.0	1475	30.7	91.2	56.8	37.2	92.2	69.5	44.9	92.1	76.7	365	316	370	IE3
	200	60	42.0	1770	24.5	92.1	70.2	32.3	92.7	79.5	41.0	92.4	83.7	302	257	309	
	220	60	40.0	1775	25.6	91.6	61.6	31.9	92.7	73.3	39.1	92.8	79.5	332	311	374	
15	200	50	58.8	1470	37.1	92.8	63.0	46.6	93.4	74.6	57.8	93.1	80.4	484	331	388	IE3
	200	60	55.6	1760	31.3	93.3	74.1	42.2	93.5	82.3	54.4	93.0	85.6	408	268	322	
	220	60	52.0	1770	31.8	92.9	66.6	41.0	93.4	73.8	50.3	93.5	80.0	469	354	426	
18.5	200	50	74.0	1475	47.9	92.6	60.2	59.1	93.4	72.6	72.0	93.4	79.4	668	276	381	IE3
	200	60	69.0	1770	40.1	93.2	71.3	52.8	93.8	80.9	67.0	93.6	85.1	524	193	325	
	220	60	65.0	1775	41.3	92.8	63.4	51.6	93.8	75.3	63.6	93.9	81.3	576	234	393	
22	200	50	84.0	1470	50.6	93.6	67.1	65.1	93.8	78.0	81.9	93.3	83.1	696	252	336	IE3
	200	60	80.0	1760	44.3	94.3	75.9	60.4	94.3	83.6	78.5	93.6	86.5	574	185	290	
	220	60	75.0	1770	44.3	94.3	69.1	57.7	94.7	79.2	73.0	94.3	83.9	632	224	351	
30	200	50	114	1470	70.9	93.9	65.0	89.9	94.4	76.5	112	94.1	82.1	1090	274	366	IE3
	200	60	108	1765	60.4	94.4	75.9	82.0	94.6	83.8	106	94.1	86.9	890	205	315	
	220	60	101	1770	61.1	94.3	68.3	78.9	94.9	78.9	99.2	94.8	83.7	980	248	382	
37	200	50	144	1480	90.2	93.3	63.5	114	94.2	74.7	141	94.2	80.7	1500	250	388	IE3
	200	60	132	1775	73.4	94.2	77.2	100	94.7	84.4	129	94.5	87.3	1200	219	319	
	220	60	124	1780	74.9	93.8	69.1	97.5	94.7	78.9	122	94.8	83.8	1320	265	386	
45	200	50	172	1480	106	94.1	65.0	135	94.9	76.2	168	94.8	81.7	1780	233	382	IE3
	200	60	159	1775	87.6	95.0	78.0	120	95.3	85.1	156	95.0	87.8	1440	190	323	
	220	60	150	1780	89.1	94.6	70.1	116	95.3	79.9	147	95.3	84.5	1584	230	391	
55	200	50	200	1480	119	95.2	70.2	156	95.7	80.0	197	95.5	84.5	1960	240	357	IE3
	200	60	192	1775	104	95.5	80.1	144	95.7	86.3	188	95.4	88.4	1540	173	309	
	220	60	178	1780	103	95.3	73.5	137	95.8	82.2	175	95.8	86.1	1694	209	374	

<400V>

Output [kW]	Voltage [V]	Frequency [Hz]	Rated current [A]	Rated speed [min <sup>-1</sup> ]	Load characteristics									Starting current [A]	Starting torque [%]	Maximum torque [%]	Efficiency level (IE code)
					50% load			75% load			100% load						
					Current [A]	Efficiency [%]	Power factor [%]	Current [A]	Efficiency [%]	Power factor [%]	Current [A]	Energy consumption efficiency [%]	Power factor [%]				
0.75	400	50	1.90	1440	1.41	81.4	47.2	1.60	83.2	60.8	1.85	83.4	70.0	13.7	413	545	IE3
	400	60	1.70	1730	1.17	84.9	54.6	1.40	85.9	67.7	1.68	85.5	75.5	11.9	312	412	
	440	60	1.70	1745	1.24	83.3	47.5	1.43	85.4	60.7	1.66	85.6	69.5	13.1	378	499	
1.5	400	50	3.40	1445	2.31	85.7	54.7	2.76	86.7	67.8	3.32	86.0	75.8	23.3	275	319	IE3
	400	60	3.20	1740	1.91	87.5	64.7	2.45	87.8	75.6	3.08	86.6	81.2	20.5	215	270	
	440	60	3.00	1750	2.01	86.9	56.4	2.43	88.2	68.9	2.94	87.8	76.3	22.6	260	327	
2.2	400	50	5.30	1460	3.94	86.4	46.7	4.51	88.3	59.8	5.19	88.6	69.1	48.0	410	475	IE3
	400	60	4.70	1755	3.09	88.6	58.0	3.77	89.8	70.3	4.57	89.7	77.4	40.5	325	386	
	440	60	4.60	1765	3.35	87.5	49.3	3.89	89.5	62.3	4.54	89.9	70.7	44.6	393	467	
3.7	400	50	7.80	1460	5.16	88.9	58.2	6.30	89.8	70.8	7.67	89.4	77.9	67.0	320	415	IE3
	400	60	7.30	1755	4.27	90.1	69.4	5.60	90.4	79.2	7.12	89.6	83.6	59.0	259	358	
	440	60	6.90	1765	4.42	89.7	61.2	5.48	90.7	73.2	6.75	90.5	79.5	64.9	313	433	
5.5	400	50	11.7	1465	7.90	89.9	55.9	9.49	91.0	69.0	11.4	90.8	76.6	100	340	403	IE3
	400	60	10.7	1760	6.47	91.4	67.1	8.32	92.1	77.7	10.5	91.7	82.6	83.0	279	328	
	440	60	10.3	1765	6.75	90.8	58.9	8.24	92.0	71.3	10.0	92.0	78.2	91.3	338	397	
7.5	400	50	15.4	1460	10.1	90.8	59.3	12.4	91.6	71.7	15.1	91.2	78.6	132	345	411	IE3
	400	60	14.3	1755	8.35	92.0	70.5	11.0	92.3	80.0	14.0	91.7	84.2	109	280	330	
	440	60	13.7	1765	8.60	91.6	62.5	10.8	92.5	74.0	13.3	92.4	80.1	120	339	399	
11	400	50	23.0	1475	15.3	91.2	56.8	18.6	92.2	69.5	22.5	92.1	76.7	183	316	370	IE3
	400	60	21.0	1770	12.3	92.1	70.2	16.2	92.7	79.5	20.5	92.4	83.7	151	257	309	
	440	60	20.0	1775	12.8	91.6	61.6	15.9	92.7	73.3	19.6	92.8	79.5	166	311	374	
15	400	50	29.4	1470	18.5	92.8	63.0	23.3	93.4	74.6	28.9	93.1	80.4	242	331	388	IE3
	400	60	27.8	1760	15.7	93.3	74.1	21.1	93.5	82.3	27.2	93.0	85.6	204	268	322	
	440	60	26.0	1770	15.9	92.9	66.6	20.5	93.4	73.8	25.2	93.5	80.0	235	354	426	
18.5	400	50	37.0	1475	24.0	92.6	60.2	29.6	93.4	72.6	36.0	93.4	79.4	334	276	381	IE3
	400	60	34.5	1770	20.1	93.2	71.3	26.4	93.8	80.9	33.5	93.6	85.1	262	193	325	
	440	60	32.5	1775	20.6	92.8	63.4	25.8	93.8	75.3	31.8	93.9	81.3	288	234	393	
22	400	50	42.0	1470	25.3	93.6	67.1	32.5	93.8	78.0	41.0	93.3	83.1	348	252	336	IE3
	400	60	40.0	1760	22.2	94.3	75.9	30.2	94.3	83.6	39.2	93.6	86.5	287	185	290	
	440	60	37.5	1770	22.2	94.3	69.1	28.9	94.7	79.2	36.5	94.3	83.9	316	224	351	
30	400	50	57.0	1470	35.5	93.9	65.0	45.0	94.4	76.5	56.0	94.1	82.1	545	274	366	IE3
	400	60	54.0	1765	30.2	94.4	75.9	41.0	94.6	83.8	52.9	94.1	86.9	445	205	315	
	440	60	50.5	1770	30.6	94.3	68.3	39.5	94.9	78.9	49.6	94.8	83.7	490	248	382	
37	400	50	72.0	1480	45.1	93.3	63.5	56.9	94.2	74.7	70.3	94.2	80.7	750	250	388	IE3
	400	60	66.0	1775	36.7	94.2	77.2	50.1	94.7	84.4	64.7	94.5	87.3	600	219	319	
	440	60	62.0	1780	37.5	93.8											

# Electrical characteristics (6-Pole)

<200V>

Output [kW]	Voltage [V]	Frequency [Hz]	Rated current [A]	Rated speed [min <sup>-1</sup> ]	Load characteristics									Starting current [A]	Starting torque [%]	Maximum torque [%]	Efficiency level (IE code)
					50% load			75% load			100% load						
					Current [A]	Efficiency [%]	Power factor [%]	Current [A]	Efficiency [%]	Power factor [%]	Current [A]	Energy consumption efficiency [%]	Power factor [%]				
0.75	200	50	4.20	960	2.92	79.8	46.4	3.34	81.9	59.5	3.87	81.9	68.3	24.4	238	350	IE3
	200	60	3.80	1155	2.41	83.3	54.0	2.90	83.9	66.7	3.52	83.2	74.0	21.0	200	326	
	220	60	3.80	1165	2.58	81.4	47.1	2.96	83.5	59.6	3.44	84.0	68.2	23.1	242	394	
	230	60	3.80	1165	2.69	80.6	43.4	3.03	83.2	56.0	3.46	84.0	64.9	24.2	265	431	
1.5	200	50	7.80	970	5.87	84.8	43.5	6.64	87.0	56.3	7.61	87.2	65.2	61.0	337	495	IE3
	200	60	7.00	1165	4.82	87.7	51.2	5.71	88.9	64.0	6.82	88.6	71.7	50.0	244	398	
	220	60	7.00	1170	5.19	86.1	44.0	5.89	88.3	56.8	6.76	88.8	65.6	55.0	295	481	
	230	60	7.00	1170	5.41	85.4	40.7	6.05	87.9	53.1	6.83	88.7	62.1	57.5	323	526	
2.2	200	50	10.6	970	7.06	88.7	50.7	8.42	89.7	63.1	10.1	89.3	70.7	84.0	330	538	IE3
	200	60	10.0	1165	6.04	89.8	58.6	7.56	90.3	69.8	9.38	89.5	75.6	68.0	255	459	
	220	60	9.60	1170	6.29	89.1	51.5	7.51	90.5	63.7	8.97	90.4	71.2	74.8	309	555	
	230	60	9.60	1170	6.48	88.6	48.0	7.57	90.3	60.6	8.90	90.6	68.5	78.2	337	607	
3.7	200	50	16.6	970	11.3	88.7	53.4	13.5	89.6	66.4	16.1	89.3	74.2	123	289	422	IE3
	200	60	15.6	1165	9.53	90.1	62.2	12.0	90.6	73.5	15.0	90.0	79.3	102	223	348	
	220	60	14.8	1170	9.94	89.5	54.5	12.0	90.7	67.1	14.4	90.6	74.6	112	270	421	
	230	60	14.8	1175	10.3	88.9	50.7	12.1	90.5	63.6	14.3	90.8	71.8	117	295	460	
5.5	200	50	23.8	970	15.5	91.1	56.4	18.9	91.6	68.9	23.0	91.1	75.9	176	250	390	IE3
	200	60	22.2	1160	13.3	92.2	64.8	17.2	92.2	75.3	21.5	91.7	80.4	145	178	286	
	220	60	21.2	1170	13.7	91.6	57.4	16.8	92.4	69.6	20.5	92.2	76.3	160	215	346	
	230	60	20.8	1175	14.1	91.3	53.7	16.9	92.2	66.4	20.2	92.3	73.9	167	235	378	
7.5	200	50	31.2	965	19.2	91.2	61.8	24.3	91.4	73.1	30.4	90.6	78.6	204	257	292	IE3
	200	60	30.0	1160	16.7	92.1	70.2	22.4	92.0	78.7	29.0	91.0	82.1	172	205	233	
	220	60	28.0	1170	17.0	91.8	63.1	21.6	92.4	73.9	27.1	91.9	79.1	189	248	282	
	230	60	27.4	1175	17.4	91.2	59.5	21.6	92.1	71.0	26.5	91.9	77.2	198	271	308	
11	200	50	45.4	965	28.0	91.8	61.8	35.4	91.9	73.3	44.1	91.1	79.0	308	268	305	IE3
	200	60	43.0	1160	24.2	93.0	70.6	32.4	92.8	79.2	41.9	91.7	82.7	260	214	243	
	220	60	40.4	1170	24.6	92.7	63.4	31.3	93.1	74.2	39.2	92.6	79.5	286	259	294	
	230	60	40.0	1170	25.4	91.8	59.2	31.5	92.7	71.0	38.7	92.6	77.1	299	283	321	
15	200	50	62.2	970	38.0	92.1	61.8	48.2	92.2	73.1	60.4	91.2	78.7	360	262	286	IE3
	200	60	59.4	1160	32.7	93.5	70.8	44.3	93.0	78.9	57.6	91.7	81.9	312	217	236	
	220	60	55.2	1170	33.3	93.0	63.5	42.7	93.3	74.0	53.7	92.6	79.1	343	263	333	
	230	60	54.2	1175	34.2	92.4	59.6	42.6	93.0	71.3	52.6	92.6	77.3	359	287	366	
18.5	200	50	79.2	975	52.1	91.9	55.8	63.3	92.7	68.3	76.6	92.4	75.4	524	303	329	IE3
	200	60	73.2	1170	42.9	93.3	66.7	55.9	93.6	76.6	70.8	93.0	81.1	450	249	270	
	220	60	69.8	1175	44.8	93.0	58.3	55.2	93.8	70.3	67.6	93.7	76.7	495	301	327	
	230	60	68.8	1180	46.1	92.7	54.3	55.5	93.7	66.9	66.7	93.8	74.2	518	329	357	
22	200	50	91.2	970	57.8	92.8	59.2	71.8	93.2	71.2	88.2	92.9	77.6	592	290	317	IE3
	200	60	85.6	1165	48.9	93.9	69.2	64.7	93.9	78.4	82.7	93.3	82.3	508	238	259	
	220	60	80.8	1175	50.1	93.7	61.5	63.0	94.2	72.9	77.9	94.0	78.8	559	288	313	
	230	60	78.4	1180	50.8	93.4	58.2	62.5	94.2	70.4	76.1	94.2	77.1	584	315	343	
30	200	50	122	980	79.5	94.2	57.8	98.1	94.6	70.0	120	94.2	76.7	952	347	389	IE3
	200	60	116	1175	68.1	94.7	67.1	88.9	94.8	77.1	113	94.2	81.6	816	279	313	
	220	60	110	1180	69.6	94.4	59.9	86.8	94.9	71.7	107	94.8	77.9	898	338	379	
	230	60	108	1185	71.0	94.1	56.4	86.6	94.8	68.8	105	94.8	75.9	938	369	414	
37	200	50	146	975	88.8	94.0	63.9	113	94.0	75.1	142	93.3	80.5	1000	297	349	IE3
	200	60	140	1170	77.5	95.6	72.1	105	95.1	80.1	136	94.1	83.2	860	239	281	
	220	60	130	1175	77.5	94.8	66.0	100	94.9	76.5	127	94.3	81.3	946	289	340	
	230	60	128	1180	78.8	94.1	62.6	99.6	94.6	74.0	124	94.2	79.7	989	316	372	
45	200	50	176	985	107	94.7	64.2	137	94.8	75.1	171	94.3	80.6	1300	273	396	IE3
	200	60	168	1175	92.3	95.3	73.9	125	95.2	81.7	162	94.5	84.7	1144	217	290	
	220	60	156	1180	92.7	95.1	67.0	120	95.3	77.2	152	95.0	82.0	1258	263	351	
	230	60	152	1185	95.0	95.0	62.6	120	95.3	74.0	149	95.1	79.8	1316	287	384	

<400V>

Output [kW]	Voltage [V]	Frequency [Hz]	Rated current [A]	Rated speed [min <sup>-1</sup> ]	Load characteristics									Starting current [A]	Starting torque [%]	Maximum torque [%]	Efficiency level (IE code)
					50% load			75% load			100% load						
					Current [A]	Efficiency [%]	Power factor [%]	Current [A]	Efficiency [%]	Power factor [%]	Current [A]	Energy consumption efficiency [%]	Power factor [%]				
0.75	400	50	2.10	960	1.46	79.8	46.4	1.67	81.9	59.5	1.94	81.9	68.3	12.2	238	350	IE3
	400	60	1.90	1155	1.20	83.3	54.0	1.45	83.9	66.7	1.76	83.2	74.0	10.5	200	326	
	440	60	1.90	1165	1.29	81.4	47.1	1.48	83.5	59.6	1.72	84.0	68.2	11.6	242	394	
	460	60	1.90	1165	1.35	80.6	43.4	1.52	83.2	56.0	1.73	84.0	64.9	12.1	265	431	
1.5	400	50	3.90	970	2.93	84.8	43.5	3.32	87.0	56.3	3.81	87.2	65.2	30.5	337	495	IE3
	400	60	3.50	1165	2.41	87.7	51.2	2.86	88.9	64.0	3.41	88.6	71.7	25.0	244	398	
	440	60	3.50	1170	2.60	86.1	44.0	2.94	88.3	56.8	3.38	88.8	65.6	27.5	295	481	
	460	60	3.50	1170	2.71	85.4	40.7	3.03	87.9	53.1	3.42	88.7	62.1	28.8	323	526	
2.2	400	50	5.30	970	3.53	88.7	50.7	4.21	89.7	63.1	5.03	89.3	70.7	42.0	330	538	IE3
	400	60	5.00	1165	3.02	89.8	58.6	3.78	90.3	69.8	4.69	89.5	75.6	34.0	255	459	
	440	60	4.80	1170	3.14	89.1	51.5	3.75	90.5	63.7	4.49	90.4	71.2	37.4	309	555	
	460	60	4.80	1170	3.24	88.6	48.0	3.79	90.3	60.6	4.45	90.6	68.5	39.1	337	607	
3.7	400	50	8.30	970	5.64	88.7	53.4	6.73	89.6	66.4	8.06	89.3	74.2	61.5	289	422	IE3
	400	60	7.80	1165	4.77	90.1	62.2	6.02	90.6	73.5	7.48	90.0	79.3	51.0	223	348	
	440	60	7.40	1170	4.97	89.5	54.5	5.98	90.7	67.1	7.19	90.6	74.6	56.1	270	421	
	460	60	7.40	1175	5.16	88.9	50.7	6.06	90.5	63.6	7.13	90.8	71.8	58.7	295	460	
5.5	400	50	11.9	970	7.73	91.1	56.4	9.44	91.6	68.9	11.5	91.1	75.9	88.0	250	390	IE3
	400	60	11.1	1160	6.65	92.2	64.8	8.58	92.2	75.3	10.8	91.7	80.4	72.5	178	286	
	440	60	10.6	1170	6.86	91.6	57.4	8.41	92.4	69.6	10.3	92.2	76.3	79.8	215	346	
	460	60	10.4	1175	7.04	91.3	53.7	8.45	92.2	66.4	10.1	92.3	73.9	83.4	235	378	
7.5	400	50	15.6	965	9.60	91.2	61.8	12.2	91.4	73.1	15.2	90.6	78.6	102	257	292	IE3
	400	60	15.0	1160	8.37	92.1	70.2	11.2	92.0	78.7	14.5	91.0	82.1	86.0	205	233	
	440	60	14.0	1170	8.49	91.8	63.1	10.8	92.4	73.9	13.5	91.9	79.1	94.6	248	282	
	460	60	13.7	1175	8.68	91.2	59.5	10.8	92.1	71.0	13.3	91.9	77.2	98.9	271	308	
11	400	50	22.7	965	14.0	91.8	61.8	17.7	91.9	73.3	22.1	91.1	79.0	154	268	305	IE3
	400	60	21.5	1160	12.1	93.0	70.6	16.2	92.8	79.2	20.9	91.7	82.7	130	214	243	
	440	60	20.2	1170	12.3</												

## Slide base

### <Slide base>

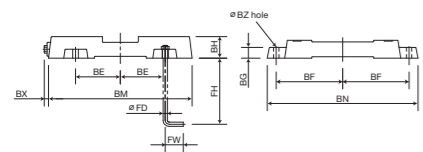


Figure 1

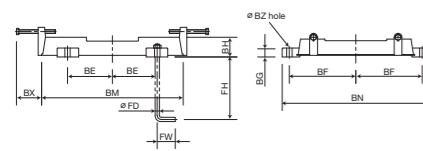


Figure 2

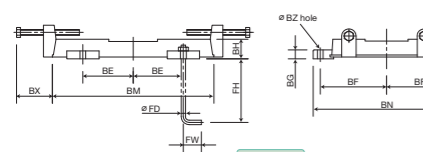


Figure 3

Frame size	Figure No.	Length of base (mm)								Discount moving distance (mm)	Bolt (mm)			Approx. weight (kg)
		BE	BF	BG	BH	BM	BN	BX	BZ		FD	FH	FW	
80M	1	65	90	15	30	210	210	11	13	40	(10)	(70)	(40)	2.0
90L		70	105	15	30	225	240	12	13	40	(10)	(70)	(40)	2.2
100L		80	115	20	40	265	260	12	13	50	(10)	(70)	(40)	3.0
112M		95	115	20	40	285	260	12	13	50	(10)	(70)	(40)	3.5
132S		110	120	25	45	350	280	13	13	60	(10)	(70)	(40)	5.0
132M			355			318	6.0							
160M		125	165	30	50	406	380	12	16	70	(12)	(110)	(50)	8.5
160L			185			404	420							10
*160M		2	165	26	50	406	372	70	16	70	(12)	(110)	(50)	9.0
*160L			185			412	410							9.5
180M	140	185	25	55	450	410	100	16	80	(12)	(110)	(50)	14	
180L		205			450	450							16	
200M	3	210	30	60	520	470	100	19	100	(16)	(170)	(65)	20	
200L		230			510	510							22	
225S		180			217.5	30							60	570
225M	230		510	510	25									

Note) 1. There are 4 moving discount bolts in figure 2 and 3.  
 2. No base bolt attached.  
 3. The ( ) measurement are recommended measurement when base bolts are used.  
 4. \* marks are for totally enclosed fan cooled 160M, 160L only.

## Global series

(Please contact us for more information.)

### • US series

US series satisfy Premium Efficiency or Energy Efficient of Energy Independence and Security Act (EISA).

The series are certified by Conformity Certification No. (CC No.)

\*The series do not satisfy UL standards.

### • Chinese series

China series satisfy grade GB2 of CEL-007.

\*The series do not satisfy CCC mark.

### • European (EU) Series

Europe (EU) series satisfy Commission Regulation (EC) No. 640/2009.

The series satisfy IE3 Efficiency and also CE Marking.

### • Russian Series

Russian series satisfy EAC certification for low voltage motor.

Country/Region	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
U.S.A	EP Act: The Energy Policy Act EP Act: (=IE2) Regulation			EISA: Energy Independence and Security Act NEMA Premium (=IE3) Regulation							
China	CEL-007: Energy Efficiency Labeling Regulations Old GB2 (Standard efficiency + α, GB18613-2006) Regulations				New GB3 (=IE2, GB18613-2012) Regulations				New GB2 (IE3) Regulations		
Europe (EU)	European Commission Rules IE2 Regulations						IE3 Regulations (over 7.5kW)			(over 0.75kW)	

## Selection and application of motors for energy saving

To save electricity effectively, it is necessary to consider various perspectives about each item of selection, operation, and maintenance. When selecting motors, first decide voltage, frequency, number of poles, output power, frequency of use, and mounting method.

In addition, it is necessary to decide ambient conditions, connection methods with load, and mechanical options.

### Power supply

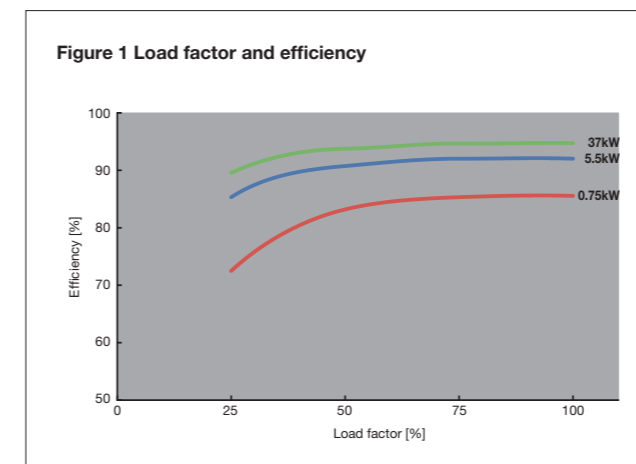
Motors are designed to have their best performance when operating according to rated voltage and rated frequency displayed on the nameplates. To avoid using in different condition from nameplates leads to an effective energy saving.

### Efficiency of motors

Efficiency of motors is ratio of output to input. When selecting motors, please carefully consider load factor, output power, and number of poles as mentioned below;

#### 1. Load factor and efficiency

As Figure 1 shows, motors generally have maximum efficiency with 75%~100% of load factor. Thus, if the motors are operated in this range, it would save energy the most. If load factor is too low, motors may have to be reconsidered.



#### 2. Output power and efficiency

As Figure 1 indicates, efficiency of motors in rated load (100% of load factor) becomes higher as the motor capacity becomes large. However, as mentioned above, efficiency is low when using motors in low load factor. It is necessary to consider the load carefully and decide the motor capacity. Also, to reduce power loss due to idle running of motors, it may need to stop operating the motors when they are not used.

#### 3. Rotational speed and efficiency

Efficiency of motors generally depends also on the speed. If load is fixed, the number of poles and speed will be decided considering the usage of saving electricity, efficiency of deceleration devices, etc.

Also, if motors need to operate in variable speed, VARIABLE SPEED DRIVE is necessary to control operation for various load change.

## Precaution when using high efficiency motors

High efficiency motors generally rotate faster than standard efficiency motors because of generated loss reduction.

If standard efficiency motors are replaced by high efficiency motors in pump, fan, etc. applications, the rotational speed becomes faster and the output increases.

Although efficiency of motors is high, power consumption may increase with increased output power.

Also, primary and secondary resistance may be decreased to reduce copper loss, which results in high starting current compare to standard efficiency motors. In that case, breaker may have to be changed.

# Toshiba Variable Speed Drive series

Plentiful variations, from simply adjustable speed control to vector control

## Notes in case operating motors with variable speed drive (VSD)

### Starting characteristics

When a motor is driven by VSD, its operation is restricted by the VSD's overload current rating, so the starting characteristic is different from those obtained from commercial power supply operation.

Although the starting torque is smaller with VSD than with the commercial power supply, a high starting torque can be produced at low speeds by adjusting the V/f pattern torque boost amount or by employing vector control.

(It depends on motor specification and setting of VSD (maximum 200%)), When a larger starting torque is necessary, select VSD with a larger capacity and examine the possibility of increasing the motor capacity.

### Noise

The magnetic noise of motor with VSD drives is larger than operated by the commercial supply. Moreover, when the motors are operated over rated speed, the windy noise of the motors increases.

### Vibration

(1) Toshiba VSD uses sine wave PWM control and the vibration is small. However, it experiences more vibrations than operated by the commercial power supply.

(2) Vibration may increase by base rigidity and resonance with machine etc. In such case, it may be necessary to take countermeasures mechanically such as change of base and motor coupling, etc.

### Gear, belt, chain

(1) When oil lubricated gear use, lubrication may become worst at low speed.

(2) When operating at frequencies exceeding 60 Hz, power transmission mechanisms such as gear, belts and chains, etc., may cause problems such as production of noise, a reduction in strength, or shortening of service life.

(3) When running with VSD, please contact us to confirm if the operating range is tolerance.

### Increase of operating frequency

Before setting the maximum frequency to 60Hz or higher, please contact us to confirm that this operating range is tolerance for the motor.

### Motor end surge voltage suppression

In the system of operating 400V class high efficiency motor driven by the voltage type PWM VSD using super high-speed switching device (e.g. IGBT), insulation degradation of motor wiring may occur by the cable length, cable installation method and the cable type. In this case, the following countermeasures are suggested.

#### • In case of normal insulation motor

Suppress the surge voltage by AC reactors or surge suppression filter to keep surge voltage at motor terminal below 850V.

#### • In case of enhanced insulation type of motor

Permissible surge voltage of motor is 1250V or less. When surge voltage is generated more than 1250V, suppress the surge voltage by AC reactors or surge suppression filter at load side of VSD.

### Input voltage

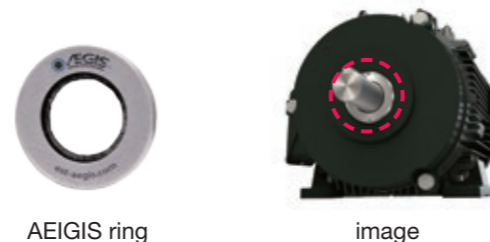
When input voltage becomes remarkably low due to vector control etc., consider using dedicated motor. In case the surge voltage becomes larger than permissive voltage, install AC reactors or surge suppression filter at load side of VSD.

### Electric corrosion in the ball bearing

When a motor is driven by a VSD, electric corrosion may happen due to sealed grease condition of bearing, wiring method or operation conditions.

Please contact us if you need any countermeasures. We have prepared AEGIS ring as an option, which is expected to lower shaft voltage.

(Countermeasures to motor to prevent electric corrosion are not provided without customer's request.)



AEGIS ring

image



## Main Specifications Tables

Model	Input voltage class	Capacity range	Overload rating	Machinery specifications			Panel specifications			Control specifications						Functions	
				Set up dial	Easy/Standard set up switch	Local/Remote switch	V/f control	Auto-energy saving control	Sensorless vector control	Sensor vector control	Torque control	Force drive system	Direct on line/Variable speed drive switch	Brake sequence system	Electric power generator control system	LCD option	
VF-nC3	3-phase 200V	0.1~3.7kW	150%-one minute	●	●		●	●	●								
	Single phase 200V	0.1~2.2kW															
	Single phase 100V	0.1~0.75kW															
VF-S15	3-phase 200V	0.2~15kW	150%-one minute	●	●		●	●	●								
	Single phase 200V	0.2~2.2kW															
VF-AS1	3-phase 200V	0.4~132kW	150%-one minute	●			●	●	●	●							
	3-phase 400V	0.75~500kW															
VF-FS1	3-phase 200V	0.4~30kW	110%-one minute			●	●	●	●								
	3-phase 400V	0.4~30kW															
VF-PS1	3-phase 200V	0.4~90kW	120%-one minute		●	●	●	●	●								
	3-phase 400V	0.75~630kW															

\*1: Optional.

**For users of the products :** Our variable speed drives are designed to control the speeds of three-phase motors for general industry.

#### Precautions

- \* If you are using the motor on equipment that could seriously affect human lives or public functions (such as nuclear power control, traffic machinery, transport machinery, life-support system, chemical plant, various types of safety equipment, etc.), please contact us for consultation.
- \* Though Toshiba's motors are made under a strict quality control, due to the environment and conditions, there is a possibility of malfunctioning. Please create a failsafe or back-up system on the equipment design, if there is any possibility of serious damage when the motor's malfunction.
- \* The usage environment's limit range is stated in the catalog and manual. Please do not use it out of the usage environment range. It could cause accidents such as injuries and fire.
- \* Please read the manual's safety instructions, and use the motor correctly.
- \* If the motors are used for personal transports or elevators, please establish a protection device for safety of the equipping side.
- \* Contact to your nearest Toshiba representative in advance if you are to use the product in a clean room or for a food product machine. If you use a standard product to which a special treatment has not been made, grease and oil may leach out of the spigot joint and the shaft pass-through part of the bearing bracket and the stator frame. You need to pay attention when using the product in a place where oil should not be spilled.

For further information, please contact your nearest Toshiba Representative.  
The information in this brochure is subject to change without notice.

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